SARC

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The Communicator

March—April 2022

the Bi-monthly Periodical from Surrey Amateur Radio Communications

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Issues appear bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of ***The Communicator***, our history, photos, videos and other information.

To subscribe, unsubscribe or change your address for e-mail delivery of this electronic magazine, notify **communicator @ ve7sar.net**

If you find ***The Communicator*** worthwhile, regular readers who are not SARC members are invited to contribute a $5 annual donation towards our Field Day fund via PayPal.

SARC maintains a website at **www.ve7sar.net**

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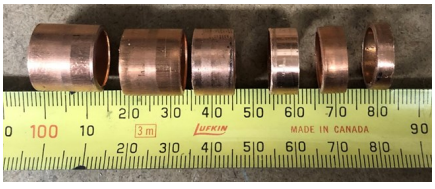

Automatic antenna tuners and couplers—Page 42

...and so much more!

QRM -·-· ·-· --

...from the Editor's Shack

Do you have a photo or bit of Ham news to share? An Interesting link?

Something to sell or something you are looking for?
*eMail it to **communicator at ve7sar.net** for inclusion in this publication.*

We're back with another big issue. This time you will find several antenna articles including one that I collaborated on with Kevin VE7ZD. It all arose from the purchase of a new DMR triband radio before Christmas and my quest to discover the 220 MHz band, that I had never before worked.

While building the antenna I ran into some interesting discoveries. After talking to some of the other Elmers in our group, Kevin and I decided it would be the subject of an interesting joint article.

We have had some great propagation for contesting in the last month or so. Solar conditions are definitely improving and we're looking forward to June when we can perhaps have our first outdoor field day with minimal or no restrictions.

Our online basic certification classes continue to be filled to capacity, and with a waiting list, but there again we hope to be able to resume in-person teaching in the classroom in the near future. We have had a CW course on standby for several months. First, when it looked like COVID might be subsiding in the late fall, only to have to cancel in January. But it now looks like we may have some progress getting past the restrictions.

Requests to be on our Communicator mailing list have sky-rocketed, and we will happily add you to that list. All you have to do is send an email to communicator@ve7sar.net with 'subscribe' as the subject. We're always happy to get your feedback as well.

73,

~ John VE7TI, Editor
communicator@ve7sar.net

This Month's Cover...

Another great issue for you, thanks to our contributors. This time there are articles on antennas, tuners, VHF, hardware and much more. The photo was taken at the station of VE7IO after the BC QSO Party. The SARC mobile 100' tower and HF beam sparkles in the sunset beside his own SteppIR.

"Oh what a tangled web we weave, when first we practice to transceive"
- Braden Glett KD8ZM

On the Web

ve7sar.net

Between Communicators, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

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The Rest Of The Story…

An Early B.C. Coastal Radio Man

John MacFarlane VA7PX

Clarence Edgar Carver VE5EL

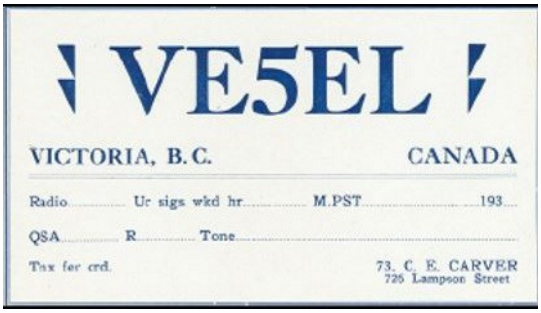
Roy E. Carver responded to my request about his Dad, Clarence Carver, who had been an early Pacific coastal radio operator. Roy E. Carver (in an email to me) stated "My father, Clarence Edgar Carver, emigrated to Canada (Victoria) from England as a boy, in 1913, with his father and an older brother. His mother and younger brother came out later."

He developed a passion for radio, and taught himself by building the radio components, and constructing and using one of the first amateur radios in Victoria. (His 1930s call sign was VE5EL). He owned a locksmith and small engine repair store in Victoria. He formed and played in a dance band. With his father, he started one of the first jitney services (taxi) in Victoria."

VE5EJ

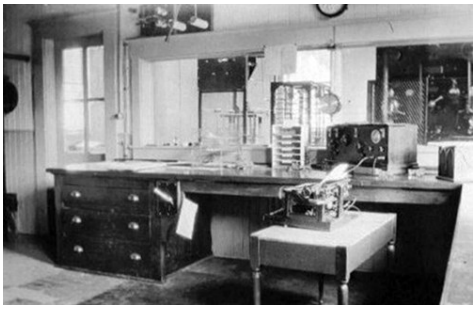
Clarence joined the West Coast Radio Service, and he was posted up and down the Pacific coast in the 1920s, traveling on CPR ships and living and operating radio stations at remote locations. He was the first radio operator in 1923 at the station on Lennard Island. When that station closed, he assisted George Gilbert in the laying of a submarine telephone cable from Lennard Island to the Tofino Life Boat Station. He worked at the Tofino Life Boat station as the radio operator until 1925.".

Later in 1929 Clarence decided to sign on to the Empress of Asia and did a few trans–Pacific voyages to the Philippines and Japan as a Marconi Operator. (The Marconi Company had the monopoly on operating radios on deep sea ships at the time.) He also worked for the British Columbia Telephone company in 1930 and worked at the Bamfield Cable Station."

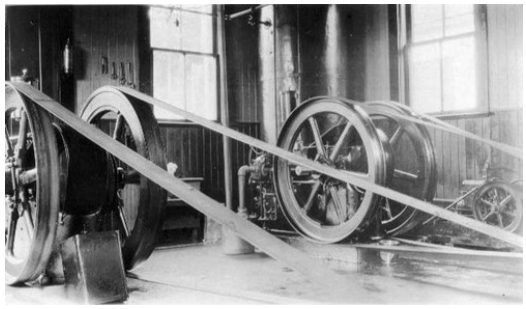


The QSL card for station VE5EL used by Clarence Carver to acknowledge radio contacts made with other amateur radio stations. (Photo from the Roy E. Carver collection.)

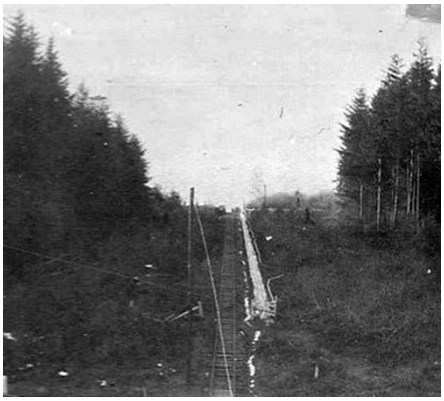
In 1925–1927 he served at the Alert Bay Radio Station (VAF) as a Radio Operator. Photos from the Roy E. Carver collection



The operating console at Alert Bay Radio Station



The engine room at the Alert Bay Radio Station

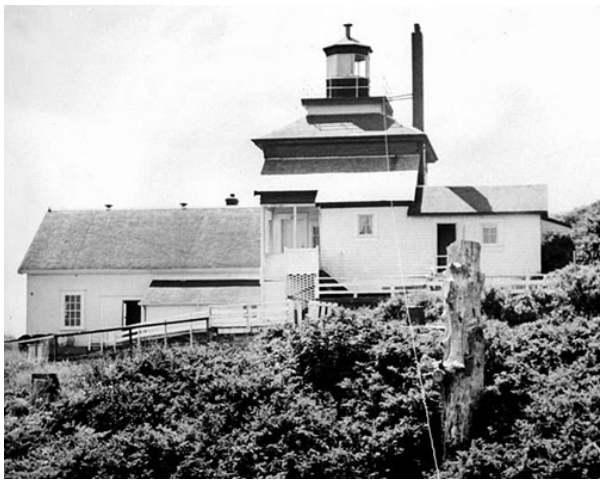


A tramway was employed to carry goods from the waterfront up the hill to the station.

Light Station Keeper

In 1931 with the economy taking a major downturn Clarence decided he needed a job to see him through the hard times, so applied to be a light station keeper. He was accepted and assigned to the Quatsino Sound Light Station (at Kains Island) in the fall of 1933. He had his amateur radio station (ham radio) with him (call sign VE5RN)."

In the photo *[right]*, the building to the right of the main building is a utility shed, buildings to the left is the machinery building and the radio shack. Kains island is about 35 acres, with a very rocky shore line making it extremely difficult to land at any time. The light was 90 feet off the water and could be seen at about 15 miles. The light was a kerosene lamp with a large glass reflector assembly sitting in mercury in a basin, turned with a gear, by a hand wound spring that needed to be wound up twice a night to keep the lamp turning (similar to an old wind up record player).



Kairns Island Light

... the supply ship CGS Estevan brought ashore (once a year) supplies and goods

The fog horn was blown by compressed air made by two sets of gasoline engines powering compressors keeping a large air tank full with compressed air. The horn was blown at set intervals by an air operated timing devise. There was no electricity in the main build or running water. There was a gasoline pressure lamp, kerosene lamps and candles. There was a cast iron water pump at the kitchen sink which the brought water up from a cistern below the floor where rain water was piped into it from the roof. A coal burning stove in the kitchen supplied the heat and the cooking. Father had radios that allowed communication between ships and the RCAF base at Coal Harbour, 15 miles away.

There was no flat ground in and around the station and most of the island, three 2 x 12 plank side walks allowed him to walk between the buildings and the approximately one quarter mile to the landing site, where there was a derrick that allowed the station boat to be put in the water, weather permitting. This is where the supply ship CGS Estevan brought ashore (once a year) supplies and goods for the keeper and family, dozens of cases of canned goods, and groceries. This was stored in a large warehouse building above the landing. Also 45 gallon drums of gasoline and lube oil for the machinery, and kerosene for the lamps. Also a few tons of coal was brought ashore, stored in large bins next to the warehouse for heat and cooking. The drums and any lumber was usually floated ashore. The rest was loaded in the Estevan's 20 foot shore boat with the ship's derrick, rowed ashore by four men on oars with a coxswain aft and a man forward to connect the landing derrick hook to the load. Often a cargo net lifted the stores out of the shore boat, onto the landing. From the landing all items would be loaded on to a rail trolley, pulled up by a gasoline motor/winch and then stored in a warehouse. All this was this was wheeled by hand cart over the board walk to the main building as needed. This transfer of goods from the Estevan often lasted two to three days and longer if the weather was bad. It was not unusual to stop the transfer and wait out a summer storm for a day or two.

In the late spring of 1934 Clarence's fiance arrived at the station from Victoria and they were married at the station, a minister a friend and an RCMP constable attending from Port Alice. In July of 1935 a son was born in Victoria, in a nursing home on Cook Street. In May of 1938 a daughter was born in the Port Alice mill hospital. Occasionally the family would make trips to Vancouver and Victoria, traveling on the Union and CPR steam ships that traveled up and down the East and West coast of Vancouver Island."

Active Pass Light
(Photo from the Roy E. Carver collection.)

Active Pass light

In 1940 Clarence developed an abscess in the left eyelid. On visits to doctors over time in Victoria no one knew how to treat the worsening ailment. So he asked for a transfer to a station location where it would be easier to see doctors. In 1944 he and the family was transferred in the C.G.S. Estevan (a buoy tender and light station supply ship) to the Active Pass light station (on Mayne Island) that allowed him to get off the island once a week to go to Victoria. It was a big change for the family, the C.G.S. Berens (buoy tender and light station supply ship) only supplied supplies and materials for the light station. Anything the family needed was obtained in the two stores on the island, plus items could be ordered and shipped in by steamer to the island. And there was a school for the children.

Lampson Street Station

Over the years the abscess got much worse as the doctors couldn't help him. In the spring of 1947 Clarence retired to property in Saanich BC and he passed away in the fall of 1949 from cancer in the left eye, which went to his brain."

… And the rest is his story.

~ *John MacFarlane VA7PX (with Roy E. Carver) (2021) Clarence Carver – Early Coastal Radio Man. Nauticapedia.ca 2021. http://nauticapedia.ca/Gallery/Carver_Clarence.php*

Clarence's final amateur radio station while living on Lampson Street in Esquimalt BC.
(Photo from the Roy E. Carver collection.)

December 1948—Gil

Mike Weir VE9KK

My ham radio adventure continues…

Mike Weir, VE9KK, writes from New Brunswick, Canada. Contact him at: ve9kk@hotmail.com

VE9KK Blog: (ve3wdm.blogspot.com)

As I have blogged in the past, I have been taking part in the CWops mini weekly contests. It gives me some nice practice for an hour. Things have been going very well using N1MM+ contest software. Until my last CWops contest. N1MM+ uses macros to send your call and the contest exchange, you just push the key for the designated macro and you are off to the races. Well up until my last contest this was how it was working… then not so much.

I pressed the key to send my exchange, the Icom 7610 went into transmit and N1MM+ sent "Mike NB" (my name and province) BUT this time the radio got locked in a transmit loop and sent the exchange over and over. The only way to stop it was to turn the power off on the radio. I was not sure if it was a software glitch with N1MM or what. I continued and the issue did not come back… well for a little while that is. This time I sent my call sign and it was locked in a transmit loop!

When these anomalies happen I always try to look back at what I had changed since the last time it was working just fine. The first thing that came to mind was just before the contest I updated N1MM, so I loaded a previous version (always keep them in a desktop folder for the just in case moment). I then went back into the contest and within short time it happened again with a transmit loop.

There were no other changes that were made so instead of using the macros in N1MM I sent using my Key… old-style contesting. Doing this I had no issues at all so then I used my wireless keyboard. There was no issues using that so next, I used my old USB keyboard. and no issues with that.

Things are narrowing down to my Lenovo pro 2 keyboard as the issue. Since the issue only happens during transmit I am guessing it's an RF issue with the keyboard. I had some spare rf chokes and I placed them at the USB connector end of the keyboard and that did the trick. Funny thing I had been using this keyboard for over 2 weeks in contests without issue. But that is how RF works and I am glad that I am still able to use my Lenovo keyboard and have no more issues.

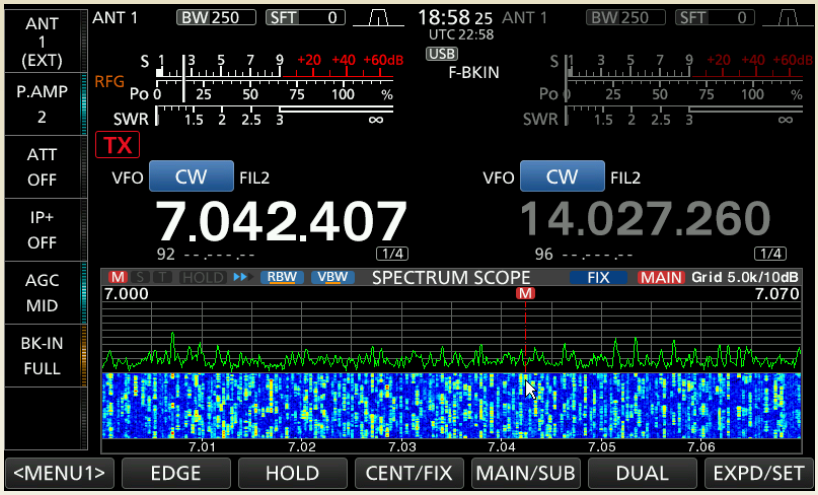
~ Mike VE9KK

Amazing weekend on the radio!

This past weekend was the running of the ARRL International DX CW contest. If you are not a CW buff then there is also an ARRL International DX SSB contest March 5-6. These contests are great to log some very nice DX stations. I had a few interesting one-offs in this contest but more on that later. If you are a frequent reader of my blog you will know I have graduated from search and pounce contesting to holding my own and calling CQ contest or running as it's called.

In this contest, DX stations are only allowed (to gain points) to contact stations in North America and likewise, North American stations can only contact DX stations. With this in mind, I knew that it would be interesting for me to be on the calling (running) CQ contest end of things. The contest is 48 hours in length and as always I have high hopes of getting into the action at the start, Friday at 8 pm. Well as always it's Friday and I just want to relax and take it easy. So as always I started Saturday morning and I was not disappointed the bands were very very busy with DX.

Before beginning the contest I opened up my go-to CW practice program G4FON contest trainer. I find it to be very helpful to get my ears warmed to fast speed CW before going live! I spent about 15 minutes with G4FON and then it was off to the races. I started out sending CQ CONTEST at 31 WPM but found most stations coming back to me came back at around 24-30 WPM. I then slowed things down a bit as I don't want to be sent at speeds where no one wants to answer me.



Kairns Island Light

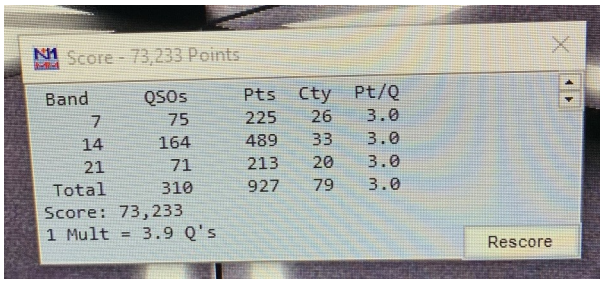
Saturday morning and afternoon went well and here is one of those "one-offs" I was mentioning earlier. On Saturday EA3OH spotted me on a cluster....all of a sudden all hell broke loose!! I called CQ CONTEST DE VE9KK and 10-15 stations (most all at once) were calling me. I had NEVER had this happen and I can understand what rare DX stations go through. If this was not a contest I would have worked split but as they say, it's not a perfect world. Once the first 3 seconds of what I called a CW mess finished then one of two stations would toss out their call. This would allow me to work with them and I continued to work this way. Sometimes a few stations waited and I could only get 2 or 3 letters of their call. I would send out those letters followed by ?. This worked very well but I assumed some stations just moved on and came back later.

I was spotted about 4 different times and to be honest I felt overwhelmed and I started at times to make silly mistakes. Hitting incorrect keys so wrong call letters were sent, not hitting a correct key on my contest program so instead of my exchange being sent I sent TU (thank you). I could just imagine the look on the face of the station I was contacting. At one point I called Julie my wife into the room and with headphones removed I gave her a listen of the "pack.

When I was spotted my hourly worked station count went to around 80-90 per hour. To be honest, those times were exhausting and at times my nerves got the best of me. I now fully understand one of the "how to's" to trying to work a popular station. Don't drop your call as soon as the station signs their call. He will only hear what I did… a CW mess. Wait until things clear, about 3 or so seconds and then drop your call in. This was how I heard stations calls or part of the calls.

Here in New Brunswick, our COVID restrictions had just been lifted to the least restrictive level. This meant going to a restaurant was almost back to normal. Julie wanted to celebrate by us going out for dinner. That gave me a nice break from the contest BUT it's time for another "one-off". Once we arrived home from our dinner out almost right away I started to feel ill. YUP bad food from the restaurant, I was sick all Saturday night and Sunday until late afternoon. This cut into my contest time and evening in the afternoon while on the radio I was not feeling the greatest.

Since we are on the subject of "one-offs" here we go again. I was on 40m (7.027) early Sunday evening and a station came back to me but it was not your standard exchange. I heard "PSE QSY UR ON CHAN 816 PSE QSY TU" I thought WHAT… so I sent "? ?" and the same message was sent. No worries I sent "SRI" and two short DIT's. After the contest, I did some online searches and came up with nothing. Does anyone know what this op was talking about I would be interested to know?



The final score

Because this was a contest with emphasis on DX I was pleased to have made some nice DX contacts such as:

- Turkmenistan is number 23 on the DXCC list
- Congo
- Japan
- South Cook island
- Liberia

There is a nice piece of software that takes your ADIF file and shows you many visual options adventure radio.

Below is just one option the program gives you to view your ADIF file. All the contacts I made in the contest.

~ Mike VE9KK

"Hi! I'm Lowell McNeil, W9PTN, president of the West Racine Bank in Racine, Wisconsin. As a banker, I can assure you that Collins radio equipment is an excellent investment. It has quality, performance and top trade-in value. These are the things we bankers look for. Many banks offer special finance rates on Collins equipment, just as Terry is offering here. I have KWM-1 at the office and a complete Collins station at home. I've been 'all-Collins' for many years."

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62S-1 VHF Converter	895.00	70.48	32.81	20.01
75S-3 Receiver	680.00	53.55	24.93	15.20
75S-3A Receiver	750.00	59.05	27.50	15.81
KWM-2 Transceiver	1150.00	90.56	42.16	25.71
KWM-2A Transceiver	1250.00	98.43	45.83	27.95
51J-4 Receiver	1464.00	115.29	53.68	32.73
51S-1 Receiver	1828.00	143.95	67.02	40.87
351D-2 Mobile Mount	120.00	9.45	4.40	2.68
MP-1 14V DC Power Supply	198.00	15.59	7.26	4.42
PM-2 Portable Power Supply	150.00	11.81	5.50	3.33
CC-2 Carrying Case	85.00	6.69	2.99	1.90
CC-3 Carrying Case	107.00	8.42	3.92	2.28
516F-2 AC Power Supply	115.00	9.05	4.21	2.57
312B-4 Speaker Console	195.00	15.35	7.15	4.36
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For further information, check number 46, on page 116

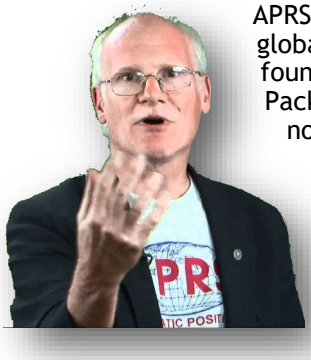
Page 12—News You Can't Lose

APRS developer Bob Bruninga, WB4APR, SK

The ARRL reports the creator of the Automatic Packet Reporting System (APRS), Bob Bruninga, WB4APR, of Glen Burnie, Maryland, died on February 7. An ARRL Life Member, Bruninga was 73. According to his daughter, Bruninga succumbed to cancer and the effects of COVID-19. Bruninga had announced his cancer diagnosis in 2020. Over the years, he readily shared his broad knowledge of and experience with APRS, among other topics in the amateur radio and electronics fields.

While best known for APRS, Bruninga was also a retired US Naval Academy (USNA) senior research engineer who had an abiding interest in alternative power sources, such as solar power. In 2018, he authored Energy Choices for the Radio Amateur, published by ARRL, which explores developing changes in the area of power and energy, and examines the choices radio amateurs and others can make regarding home solar power, heat pumps, and hybrid and electric vehicles. Bruninga drove an all-electric car and had experimented with a variety of electric-powered vehicles over the years.

APRS originated in 1982, when Bruninga wrote his first data map program that plotted the positions of US Navy ships for the Apple II platform. A couple of years later, he developed what he called the Connectionless Emergency Traffic System (CETS) on the VIC-20 and C64 platforms for digital packet communications to support an endurance race. The program was ported to the IBM PC platform in 1988, and was renamed APRS in 1992. The recognized North American APRS frequency is 144.39 MHz, and APRS is globally linked via the internet. Bruninga founded the Appalachian Trail Golden Packet (ATPG) event, which fields APRS nodes from Stone Mountain in Georgia to Mount Katahdin in Maine each July.



ARRL Contributing Editor Ward Silver, N0AX, remembered Bruninga this way: "Bob kept pushing APRS beyond its origins as a position reporting system.

He developed and helped implement numerous other uses of APRS in support of what has become the 'Ham Radio of Things,' with great potential for future amateur radio applications. Bob's far-reaching vision and imagination were as good as it gets."

Bruninga mentored USNA midshipmen in building and launching amateur radio satellites and CubeSats, beginning with PCsat in 2001. PCsat was the first satellite to directly report its precise position to users via its onboard GPS module. Subsequent USNA spacecraft included PSK31 capability (HF to UHF) and other innovations.

White said APRS remains a key staple in the new ARISS InterOperable Radio System (IORS) that's now on board the ISS. She added that Bruninga offered input for future NASA Lunar and Gateway opportunities in which ARISS hopes to take part.

Last year, ARRL CEO David Minster, NA2AA, on behalf of ARRL, honored Bruninga with a brick in the ARRL Diamond Club Terrace at ARRL Headquarters. ARRL sent him a letter of appreciation along with a replica of the brick.

Bruninga held a bachelor's degree in electrical engineering from Georgia Tech (Georgia Institute of Technology) and a master's degree in electrical engineering from the Naval Postgraduate School. Bruninga was a 20-year US Navy veteran. Dayton Hamvention® honored him in 1998 with its Technical Excellence Award.

Bruninga authored and co-authored numerous academic papers over the years, and was frequently in demand as a speaker and presenter at amateur radio gatherings.

Source: ARRL
http://www.arrl.org/news/aprs-

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

75m LIDS

By WBØRUR, on the scene

BURBANK, Ariz. –The group of n'er-do-well hams who call the 75 meter band home (and fill the airwaves with disgusting sounds, comments and vulgar language) have vowed to take back the title of "Most Vile Ham Radio Operators" after relinquishing the honor to relatively new upstarts.

"We really have let our standards slip," says an anonymous ham – a patron of the 75 meter frequencies for years. "Used to be, a few ■■■■ and a couple of ■■■■ and you were golden. But not so much anymore. Nowadays, you really need to be able to insult race and political positions, ■■■■■. And woe be to the ■■■■■■■ ham who doesn't have a quick library of sound effects to draw upon at the push of a button."

Over the past 5 years, aggressive recruiting of prolific obscenity-prone hams to 14.313 MHz and – more recently – to 7.200 MHz have cut the 75 meter band membership in half.

These 75 Meter LIDS asked us to hide their identity.

"It won't come easy. We'll have to ■■■■■■■■ rebuild our base. Plans are for several hamfest workshops across the country. These sessions will include curse word workbooks and ■■■■ laminated quick reference guides that hams may keep on their ■■■■■ operating desks."

The group admits they may never overcome the 14.313 MHz daytime propagation advantages, but feel they should be able to win strongly in the evening hours as long as those ■■■■■■■■ foreign broadcast stations don't interfere.

~ *HamHijinks.com*

Betty Crocker once cooked her entire dinner using the heat from the finals of a Collins 30S-1 amplifier

Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

The dipole experiment

Over the past couple of weeks, I conducted some experiments to see how the diameter of the elements of a dipole affects its resonance and the bandwidth of the antenna. I had always heard that "fatter" elements shorten the length of a dipole and increase its bandwidth, but I had never investigated why this was the case.

As I read about these characteristics, I thought that it would be fun to build some dipoles of various element diameters and test the theoretical aspects in the real world.

This month's column will document my journey. My results confirm the theory but differ from the predicted values in one aspect. This is interesting in and of itself; determining why will be my next goal!

A Discussion

This experiment started with a discussion with John Schouten, VE7TI in regard to his desire to build a 220 MHz antenna for his new transceiver, as documented in his article starting on page 24 in this issue of The Communicator.

John and I have known each other for decades and often put our heads together on projects, problems, and things of interest to us. John had built a nice dipole for his 220 rig out of half-inch copper pipe but then noticed that the antenna resonated significantly lower in frequency than what the formula he had used had predicted. He was not sure why this was, and so we got together via email to discuss it.

Half-inch pipe makes the 220 MHz antenna's elements quite "fat", and we had heard that this can affect the antenna's resonance, so I thought that we should investigate why.

This led us to some of the online sites that help radio amateurs compute the length of dipoles. The user enters a desired frequency, and the web site calculates relevant information such as overall dipole length, and the length of each of the dipole's legs.

Our observations:

- Most of these sites focus on HF dipoles, not VHF or UHF versions;
- Most of the sites ask only for the target dipole's center (resonant) frequency;
- A small number of the sites also ask for "element diameter";
- For those sites that ask for element diameter, the overall dipole and the

element lengths change when this extra parameter is varied; and

- There is generally no explanatory information on the site as to why the element diameter matters, or why a larger or smaller diameter changes the dipole and element length.

These were questions worth investigating.

Some Research

It was time for some more focused research into the question. It might be my generation, but I prefer to start researching problems like this by referring to books and other information that I have at home before jumping onto the 'net.

As we all know, the Internet contains a huge amount of information, but not all of it is authoritative, or even correct. I have noticed in the past few years that technical subjects are especially prone to misinformation: there are lots of web sites with erroneous explanations of scientific and technical issues. It is very easy to be led astray.

I am sure that the people who put together these documents and web sites are acting in good faith, but the fact is that not everyone is an expert, and it is easy to become overconfident in your knowledge and put together a document or web site that unwittingly spreads false information to others. Hence my reluctance to trust web sites and online explanations without having researched authoritative sources of information first.

I have a copy of the ARRL Antenna Book, 23rd (2018) edition, and Chapter 2, entitled "*Dipoles and Monopoles*" seemed like a great starting point [1]. I noted that Section 2.1.1 is entitled "*Effects of Conductor Diameter*", so I thought that I would have the answer to our question in short order.

The discussion in Section 2.1.1 focused on the "applied" aspects of dipole construction and although it stated clearly that conductor diameter has an effect upon dipole and element length that needs to be compensated for, it does not go into why this is the case. Figure 2.3 from the book is reproduced here as Figure 1 (see below). It shows that as conductor diameter increases at a given wavelength, dipole (and element) length must be reduced.

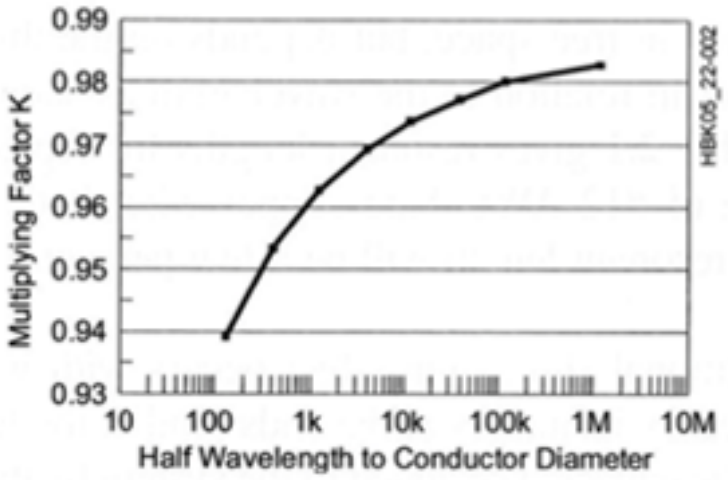


Figure 2.3 — Effect of antenna diameter on length for half-wavelength resonance in free-space, shown as a multiplying factor, K. The thicker the conductor relative to the wavelength, the shorter the physical length of the antenna at resonance. For antennas over ground, additional factors affect the antenna's electrical length.

Figure 1 - From The ARRL Handbook [1]

To determine this "Multiplying Factor K" (see y axis in Figure 1) one needs to divide a half wavelength at the desired frequency by the dipole's conductor diameter. Note that as the dipole conductor gets "fatter" the half wavelength to conductor diameter ratio gets smaller: as a result, the "Multiplying Factor K" on the vertical axis in the figure gets lower as element diameter increases.

I noted from the material in the book that at VHF and UHF frequencies involving shorter wavelengths, the half wavelength/diameter ratio (the value on x axis in Figure 1) could become quite small relative to the values on HF frequencies. Consequently, I thought that more information should have been given in the book for those building VHF/UHF antennas.

At HF frequencies, the very long wavelengths (e.g. 20, 40 or 80 metres) compared to the diameter of the wire typically used to build the antenna would almost always be very close to 1, for example 0.98 or 0.97. At VHF however (for example, 223.5 MHz), the ratio could get down to 0.93 or 0.94, a difference of about 5 percent from HF.

Five percent doesn't sound like much, but as John VE7TI had experienced with his ½" copper pipe dipole, it can make a big difference in SWR and resonant frequency.

Five percent doesn't sound like much, but as John VE7TI had experienced with his ½" copper pipe dipole, it can make a big difference in SWR and resonant frequency.

The k Factor

The graph in the Antenna Book was small and hard to read, so I decided that I wanted to find a more accurate way to compute the mysterious "k Factor" for myself. Then John and I would be able to "run the numbers" on his new antenna and see why it was resonating too low.

This led to some further research at home, and in particular an older engineering textbook on my bookshelf called "Waves, Lines and Antennas"[2]. This book discusses the k Factor and how it is computed, but it would have required development of a complicated mathematical modeling program in order to compute it for a given combination of wavelength and element diameter.

While I was interested in the question, I did not want to have to develop a complex computer program, so I decided to move online to look for other reputable sources of information.

After some searching online, I found quite a complex presentation entitled "Dipole Basics" by Steve Stearns, K6OIK that he presented at a recent ARRL Pacificon conference in California [3]. Steve's presentation was very technical and included some complex math that stressed my 40-year-old recollection of higher mathematics from my undergrad days at SFU. Nonetheless, the presentation was very interesting and I could follow what the author was saying in general terms.

Slides 40 to 47 of Steve's presentation focus on "The Mysterious Factor K" and give quite a bit of background on it. The k Factor was first documented formally in the 1940s. While the ratio is quite simple in concept, the mathematics of how it is computed has been evolving for many decades. Analytical work to refine k has focused on modeling and has been greatly improved through the development of better computers.

Figure 2 (from K6OIK's presentation) *[next page]* shows how the accuracy of the k Factor has evolved since 1941. Finally, Figure 3 *[next page]* shows the current "state of the art" in regard to the k Factor.

While I still did not have a simple formula to compute the k Factor for a given ratio (I now knew that it is a complex mathematical problem!), this graph was much more readable and would allow John and I to determine k for our own 220 MHz purposes.

Another Factor: Antenna Bandwidth

One thing that I also determined through my research is that the bandwidth (in effect, the "usable frequency range") of a dipole increases as the element diameters get larger. A "fat" dipole will have a greater usable range around its resonant frequency.

Usable range is an imprecise term, but a generally held standard considers an antenna's usable frequency range to be those frequencies where the antenna's SWR is less than or equal to 2:1. The usable range will extend both below and above the center (or resonant) frequency of the antenna.

One of the advantages of using "fatter" elements on a dipole is that this will increase the antenna's bandwidth, i.e. the range of frequencies where the SWR is at or below 2:1.

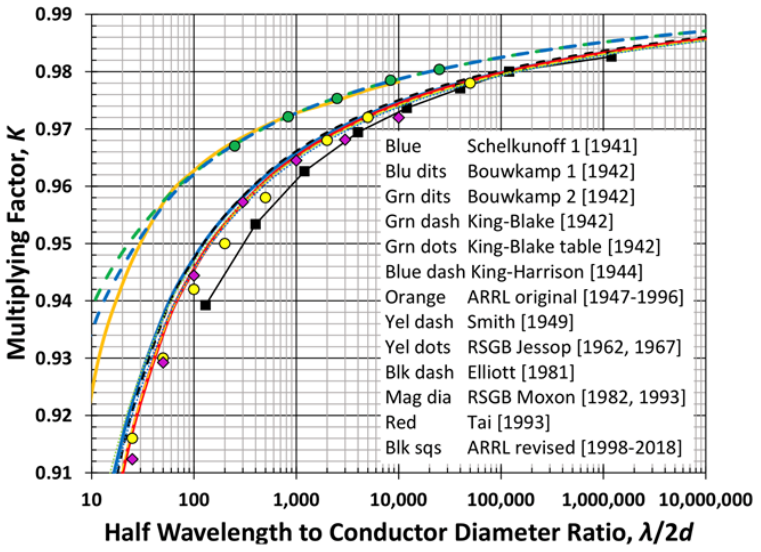
An Idea

Armed with this new knowledge, John was able to better understand why his ½" copper pipe 220 MHz antenna had measured low on resonance. I thought of a fun idea, and how we could apply our newfound understanding of the k Factor to some real world antennas.

I suggested to John that we should gather rods or pipes of various diameters and build a set of 220 MHz antennas that would show how the length of a dipole becomes shorter when the elements get fatter.

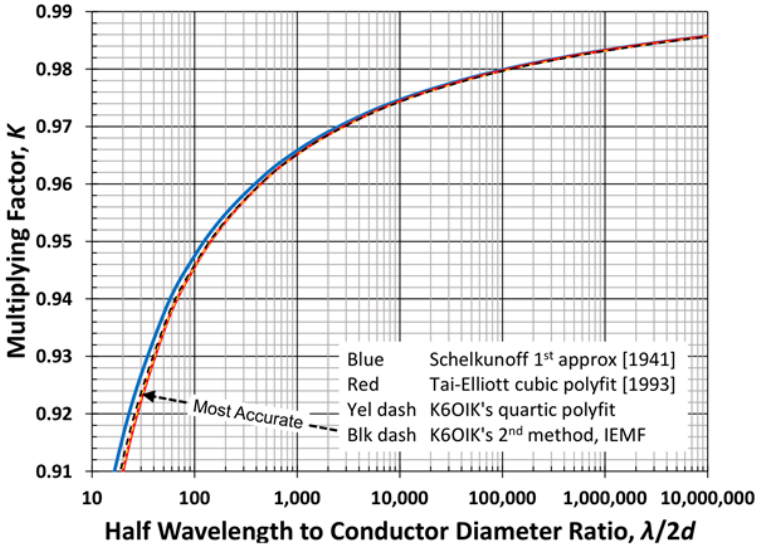
Once we had collected this set of diverse elements, we could use the half wavelength to rod diameter ratio to determine the k Factor, and then use it to build a set of 220 Mhz dipoles.

The "fatter" dipoles would have shorter elements, and this would provide a good "visual" that shows antenna theory in actual practice. We could also measure the bandwidth (or "usable range") of the antennas as described above to see how



Above: Figure 2 – Evolution of the k Factor Graph [3]

Below: Figure 3 – "State of the Art" k Factor Curve [3]



"fatter" elements affect this dipole characteristic as well.

This sounded like fun, so we embarked on "the great experiment" and went off to gather a diverse set of solid rods and tubing of various diameters.

Bringing The Dipoles to Life

My first stop was to a large local plumbing wholesaler. I was looking for surplus copper pipe of as many different diameters as the company could provide. As we were targeting 220 MHz, a half wavelength is about 70 cm in length, so I needed about "three feet" of pipe of whatever diameters the wholesaler might have available.

I was prepared to pay, if necessary, but was hoping to leverage the educational/public service component of amateur radio to secure some "freebies" from the company's junk bin.

I needed a 15-second "elevator pitch". The place was busy, and I had a few impatient burly plumbers behind me in line, so I knew that my interaction with the service counter guy had to be efficient. I prepped mentally for the conversation, as even-more impatient burly men joined the line behind me. Everyone appeared to be in a big hurry.

Although the counter guy's eyes glazed over for a few seconds when I explained who I was and what I was looking for, after a short discussion the public service aspect of amateur radio resonated with the fellow. He expressed interest, so I thought I had been making progress when he seemed to change his mind. He said coldly "we sell wholesale here and we don't deal with non-registered plumbers". Perhaps his boss had looked in our direction.

Okay, I thought, and started to thank him for his time, when he then added "go outside and stand by the staff-only door" and abruptly left his counter only to disappear inside the warehouse. The burly plumber behind me looked upset. I left the service area and dutifully went outside to stand by the staff door, not knowing what to expect.

Within a minute or so, the door opened. The counter guy was inside, friendly again, and he handed me several short lengths of copper pipe. I asked him how much I owed him, and the said "Nothing at all. If it helps people learn then I am all for it". I thanked him profusely and he disappeared back inside, undoubtedly so that he could return to the queue of impatient plumbers waiting their turn.

Kudos to the company for their "under the radar" help with this project!

My second stop in preparation for the experiment was a local hobby shop. I knew that freebies would not be an option. I bought several three-foot lengths of "hobby brass" rod and tubing of various diameters. I would be able to cut them for use as dipole elements.

On his end, VE7TI was successful in securing a three-foot length of 4" diameter aluminum heating duct that he would subsequently use to build a REALLY fat 220 MHz dipole. It looks crazy but it works! John describes his experience in building this antenna and it's surprisingly good performance in his article elsewhere in this issue of The Communicator.

The Experiment

I had rod and tubing of different diameters for five different 220 MHz dipoles. I would add a sixth dipole made out of #30 wire to this set. I wanted to be as accurate as possible in all measurements for this experiment. I would work in millimetres as a standard unit and try to cut all the dipole elements to be accurate in length to less than one half millimetre.

I needed to measure the diameter of each of the materials, because element diameter is factors used to determine k Factor.

I used a commercial high-quality metalworking caliper to obtain an accurate outer diameter for all of the lengths of rod and tubing. *[See Figure 4 top right].* I obtained the diameter of #30-gauge solid wire from a standard wire table. This information went into an Excel spreadsheet [5].

VE7TI and I chose 223.5 MHz as our design frequency, as it is near the center of the 220 MHz band. Frequency needs to be converted to wavelength for these calculations. Figure 5 *[centre right]* is the section of the Excel spreadsheet that does this.

I expanded the spreadsheet to include calculation of the wavelength (and half-wavelength) for 223.5 MHz, and then computed the ratio of have-wavelength to diameter for each of the six types of wire, rod and tubing.

This ratio was then used to calculate the k Factor for each of the antennas. The k Factor was also included in the Excel spreadsheet. Once the k Factor is known the corrected length of a half-wave dipole (with inclusion of the k Factor) is computed using the familiar formula [4] *[bottom right].* Where 'c' is the speed of light in metres per second and 'f' is the antenna's design frequency in Hertz. 'L' will be the length of the half-wave dipole in metres.

These values, which include the k Factor, were added to the spreadsheet, and this number for each antenna was also divided by two, to give the element length for each half of the dipole.

At the bottom of the page is a screenshot of the spreadsheet to this point:

Figure 4 – Caliper Measurement

Speed of light, *c* (metres per second):	299792458
Frequency (MHz):	223.5
Wavelength (λ) (mm)	1341.35328
Half Wavelength (λ/2) (mm)	670.6766398

Figure 5 – 223.5 MHz Converted to Wavelength

$$L = 0.5k\frac{c}{f}$$

Figure 6 – Standard Dipole Length Formula

Figure 7 – Spreadsheet for Element Lengths

Common Description	Measured Conductor Diameter (in)	Measured Conductor Diameter (Φ) (mm)	Ratio (λ/Φ)	k	Length of Dipole (mm)	Element Length (mm)
1" copper	0.875	22.225	30.17667671	0.948892917	636.4	318.2
1/2" copper pipe	0.625	15.875	42.24734739	0.953833523	639.7	319.9
3/8" brass	0.375	9.525	70.41224565	0.959814684	643.7	321.9
1/8" brass	0.125	3.175	211.236737	0.96824956	649.4	324.7
1/16" brass rod	0.0625	1.5875	422.4734739	0.97150577	651.6	325.8
30 gauge wire	0.01	0.254	2640.459212	0.976019441	654.6	327.3

Here's an enlargement of the most relevant columns:

Common Description	Measured Conductor Diameter (in)	Element Length (mm)
1" copper	0.875	318.2
1/2" copper pipe	0.625	319.9
3/8" brass	0.375	321.9
1/8" brass	0.125	324.7
1/16" brass rod	0.0625	325.8
30 gauge wire	0.01	327.3

Figure 8 – Materials and Calculated Element Lengths.

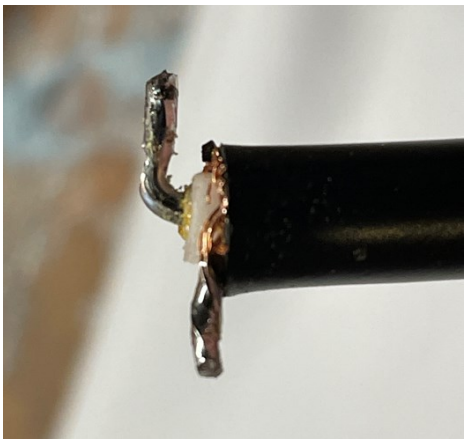
Note in this figure how the length of the dipole elements DECREASES as the diameter of the elements INCREASES! This is exactly what the k Factor predicts!

Making the Antennas

With all the element lengths calculated, it was off to the shop to cut the rod/tubing/wire and build the antennas.

The antennas would be fed by a short length of RG8X coax. I wanted to feed the antenna as closely as possible to the end of the coaxial cable. If the end of the coax separated the inner and outer conductors a distance back from the feedpoint, then the coaxial inner and outer conductors would electrically become part of the antenna elements. This would affect the overall length of each dipole. This was undesirable as I wanted the measurements to be as accurate as possible. This constraint also meant that I would not use a connector at the end of the coax.

Figure 9 – Only 1 mm of cable exposed



I cut the end of the RG8X coaxial cable square and removed only enough outer jacket to expose 5 millimetres (mm) of the shielding. I flattened this shielding away from the center conductor and exposed 5 mm of the inner conductor. I tinned both conductors and folded them perpendicularly in relation to the coaxial cable, as shown in Figure 9. I would solder the dipole elements to these tinned tabs horizontally, resulting in only 1 mm of exposed conductors between the feedline and the antenna elements.

To guard against shorting between the two coaxial conductors, I used 1 cm Teflon plumber's tape to wrap the exposed end of the RG8X cable, as shown in Figure 10.

Figure 10 – Teflon Wrapping

I attached an Amphenol RF connector at the far end of the coaxial cable and tested it.

The feedline being complete, I decided to cut all the elements. This process went smoothly (measure twice; cut once!) and I had a set of elements, all accurate in length within 0.5 mm, ready to be mounted. *[See Figure 11—top next page].*

Next, I had to find a way to mount the elements and attach the feedline to the antenna. The mount had to be non-conductive. I settled on using two wooden "painter's sticks" glued at right angles to support the elements and the feedline. I would use hot glue to affix the elements

and feedline to the painter's sticks and hold everything at right angles while the antennas were being tested. *[See Figure 12—centre right].*

With the feedline being glued to the supporting painter's stick, I placed the two dipole elements into position and soldered the center and inner conductors of the coax to the two elements. This proved easy for the smaller elements and the wire, but for the two copper pipes ("1/2" and "1" inch) even a big soldering gun could not generate enough heat. I have a small propane torch and gave that a try, but it was still "no go".

Figure 11 – Dipole Elements Ready

I struck on the idea of drilling a 1 mm hole in the end of the ½" and 1" pipes and placing a tiny 1.2 mm screw into the hole. The tiny (tiny!) screws went in well and bonded well with the pipe. I tightened them down for good electrical contact. The screws took solder easily, and I was then able to solder the two tabs from the feedline to the two screws. This did the trick.

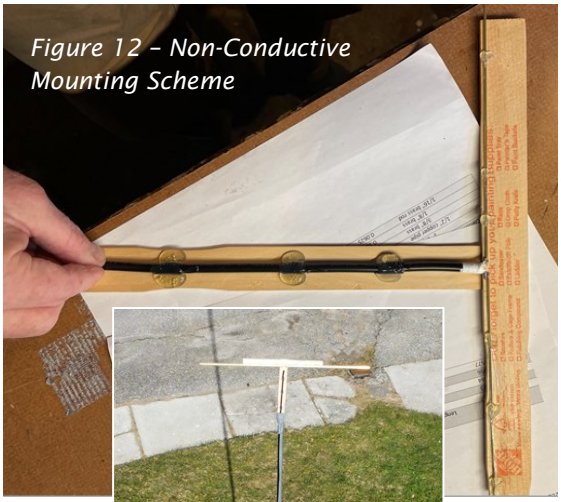


Figure 12 – Non-Conductive Mounting Scheme

Antenna Testing

Now to the "meat in the sandwich!" As I did not want to make six different feeds and supports, I tested the antennas one by one, going from the smallest to the largest elements. I used a collapsible "painter's pole" to elevate each antenna to 12 feet above the ground and situated the testing away from local obstructions.

I used a "RigExpert" AA-600 MHz antenna analyzer to test each antenna in the backyard here in Burnaby. See Figure 13 for the test setup.

Figure 13 – Test Setup

I evaluated each antenna one by one. I took screenshots of each antenna's SWR curve and identified the point of resonance and the low and high 2:1 SWR points so that I knew the antenna's bandwidth. I also measured the antenna's SWR at the design frequency of 223.5 MHz. *[See Figure 14—next page].*

Below are the final results for all the antennas.

Observations Lead to More Questions

The results of this experiment are interesting:

Note from the "2:1 Bandwidth" column on the right that the usable range of the antenna DOES increase (and increase significantly) as the diameter of the dipole elements increases. This was expected behaviour. The usable frequency range of the antenna more than doubled from the thinnest elements (#30 wire) to 1" copper pipe.

Note that the SWR for all of these dipoles is very low.

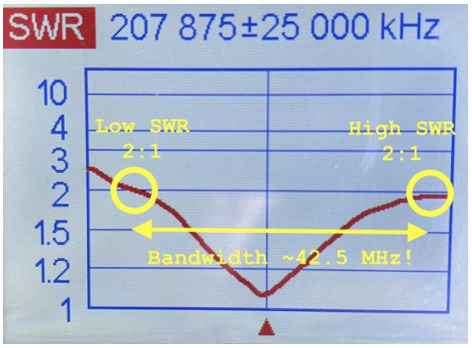


Figure 14 – Resonance and Bandwidth for 1" Copper Pipe Dipole

However, looking at the third column in the figure, I noticed that the centre frequency, i.e. the frequency of lowest SWR or resonance, varies considerably between all of the antennas. Recall that each of the antennas was very carefully calculated, measured and configured to be resonant at the design frequency of 223.5 MHz. Something had either gone wrong, or there was another unknown factor at work.

Practicality

Each of the test dipoles resonates at a frequency lower than the design frequency of 223.5 MHz. This means that relative to the design frequency, the dipoles are too long.

In practise (i.e. if I was going to actually USE these antennas for practical amateur radio operation), I would be able to shorten each of the antennas to make it resonant at 223.5 MHz. Each one of them could be made resonant at the design frequency.

I didn't do that, because doing so is beside the point of this experiment!

The Experimental Method

I consider this exercise as an interesting experiment that I learned a lot from. One aspect of the experiment didn't work out as planned, but I'm not worried about this. "Bad" results from part of an experiment exemplify the nature and the power of science and the experimental method. Science is an iterative process: observations lead to theories which are then tested through experiment. If experimental results

Figure 15 – Test Observations and Measurements

Dipole Experiment - Observations

Conductor Common Description	SWR (x:1) at 223.5 MHz	Center Frequency (MHz)	SWR (x:1)	2:1 Low (MHz)	2:1 High (MHz)	2:1 Bandwidth (MHz)
30 gauge wire	2.60	210.375	1.15	202.250	219.750	17.500
1/16" brass rod	1.80	216.000	1.25	203.500	227.250	23.750
1/8" brass rod	1.75	214.750	1.25	201.000	227.875	26.875
3/8" brass tubing	1.75	211.625	1.09	197.250	227.875	30.625
1/2" copper pipe	2.00	206.625	1.11	190.375	224.125	33.750
1" copper pipe	1.75	207.875	1.08	188.500	231.000	42.500

don't agree with the theory, then the either the experiment was not conducted properly, or the theory is incorrect.

The latter is impossible (well, at most very, very, very unlikely), as antenna theory is a well-developed field! I suspect that there is an unaccounted-for factor in the experiment which caused the results for resonant frequency to vary unexpectedly. I made a "bone head" mistake.

Each of these antennas should have been resonant at 223.5 MHz. The bigger question after the dust settles is determining why the antennas are not! This will be something for John and I to think about over the coming couple of months.

I have a couple of ideas: perhaps there is an impedance mismatch between the 50-ohm coaxial cable and the dipoles, which are typically 73-ohm impedance. Perhaps my calculation of the k Factor for each of the antennas is wrong. Perhaps the feedline impedance, configuration, or length is a factor. As the saying goes, the reason is "TBD" (to be determined).

VE7TI and I will talk about this, consult further references, and likely speak to experts in the field who may be able to show me "the error of my ways."

To be fair (see John's article), his versions of the 223.5 MHz antenna both had to be shortened, too, so I am not alone in this observation.

I hope to be able to repeat the experiment and produce predictable results after receiving additional information and incorporating that into the process.

While this aspect of the experiment was disappointing, I will use it as a lever to learning, and come out of the process knowing more than I know now. Isn't that what amateur radio is all about anyway?

Conclusion

Failure of one aspect of an experiment doesn't mean that the experiment should not be recorded or reported. The experiment was successful in all its other aspects, so while I am disappointed in a subset of the results, I am not downtrodden about it. I'll report on what I learn in the next issue.

That's it for now! Feedback on this article can be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks for reading!

73,

~ Kevin VE7ZD / KN7Q

References:

[1] "ARRL Antenna Book", 23rd Edition, 2018. ISBN-13: 978-1625950444. Newer editions also available.

[2] "Lines, Waves and Antennas" by Brown, Sharpe, and Hughes. 1961 Ronald Press Inc., Library of Congress 61-6149. Chapter 13, "The Radiating Dipole Antenna".

[3] "Dipole Basics: Steve Stearns, K6OIK". See the full presentation at https://www.fars.k6ya.org/docs/Stearns_K6OIK-Dipole_Basics-ARRL_Pacificon-Oct_2019-r1.pdf. Discussion of the k Factor starts on slide 40.

[4] See "Dipole Antenna Calculator" at the handy web site "Translators Café". URL is https://www.translatorscafe.com/unit-converter/en-us/calculator/dipole-antenna

[5] The spreadsheet is available for download at https://www.dropbox.com/s/2m1omnkkt5sbs2s/Dipoles%20-%20Communicator.xlsx?dl=0

Antenna Adventures

John Schouten VE7TI

An antenna for 220 MHz

…and some interesting discoveries

Just before Christmas I bought a new tri-band mobile transceiver. For the first time in my Amateur Radio experience, I had access to the 220 MHz band. I've discovered some interesting things, including the long history of the band and, because I had no antenna for these frequencies, I decided to build my own, like a true Amateur. What I found surprised me, read on…

History of the band

The 1.25-meter band has a very long and colorful history, dating back to before World War II. On October 10, 1924, the 5-meter band (56–64 MHz) was first made available to Amateurs in the United States by the Third National Radio Conference. On October 4, 1927, the band was allocated on a worldwide basis by the International Radiotelegraph Conference in Washington, D.C.

The Pre-Cairo Conference

Some experimental amateur use in the U.S. occurred on the "1.25-meter band" as early as 1933, with reliable communications achieved in fall of 1934.[1]

The Cairo Conference

In 1938, the United States FCC gave their Amateurs privileges in two VHF bands: 2.5 meters (112 MHz) and 1.25 meters (224 MHz).[2] Both bands (as well as 70 centimeters) were natural harmonics (multiples) of the 5-meter band. for amateur and experimental use

Amateur privileges in the 2.5-meter band were later moved to 144–148 MHz (becoming the modern-day 2-meter band), and the old frequencies were reassigned to aircraft communication during World War II. At that time, the 1.25-meter band expanded to a 5 MHz bandwidth, spanning 220–225 MHz.

The VHF/UHF explosion

Amateur use of VHF and UHF allocations exploded in the late 1960s and early 1970s as repeaters started coming on the air. Repeater use sparked a huge interest in the 2-meter and 70-centimeter (420–450 MHz) bands, however, this interest never fully found its way into the 1.25-meter band. Many amateurs attribute this to the abundance of commercial radio equipment designed for 136–174 MHz and 450–512 MHz that amateurs could easily modify for use on the 2-meter and 70-centimeter bands. There were no commercial frequency allocations near the 1.25-meter band, and little commercial radio equipment was available. This meant that amateurs who wanted to experiment with the 1.25-meter band had to build their own equipment or purchase one of the few radios available from specialized amateur radio equipment

manufacturers. Many of the repeaters which have been constructed for 1.25-meter operation have been based on converted land-mobile base station hardware,[3] often extensively modifying equipment originally designed for other VHF bands.[4]

Canadian reallocation

Until January 2006,[5] Canadian amateur radio operators were allowed to operate within the entire 220–225 MHz band. Canadian operations within 120 km of the United States border were required to observe a number of restrictions on antenna height and power levels to coordinate use with non-amateur services in the United States.[6]

In 2005, Industry Canada (now ISED) decided to reallocate 220–222 MHz to land mobile users, similar to the US, but unlike in the US, a provision was included on a secondary basis. In addition, the band 219–220 MHz was allocated to the amateur service on a secondary basis. Both reallocations went into effect January 2006.

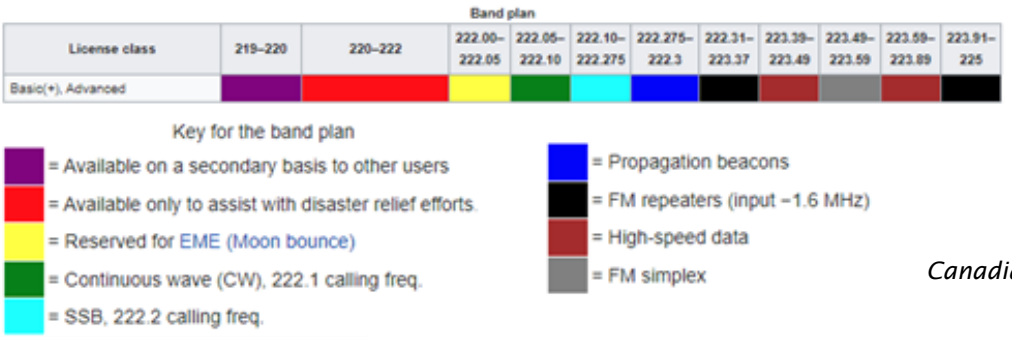
U.S. reallocation

In 1973, the FCC considered Docket Number 19759, which was a proposal to establish a Class E Citizen's band service at 224 MHz. The proposal was opposed by the ARRL and after the explosive growth of 27 MHz Citizen's Band usage, the FCC dropped consideration of the docket in 1977.[7]

In the late 1980s, United Parcel Service (UPS) began lobbying the FCC to reallocate part of the 1.25-meter band to the Land Mobile Service. UPS had publicized plans to use the band to develop a narrow-bandwidth wireless voice and data network using a mode called ACSSB (amplitude-companded single sideband). UPS's main argument for the reallocation was that amateur use of the band was very sparse and that the public interest would be better served by reallocating part of the band to a service that would put it to good use.[8]

In 1988, over the objections of the amateur radio community, the FCC adopted the 220 MHz Allocation Order, which reallocated 220–222 MHz to private and federal government land-mobile use while leaving 222–225 MHz exclusively for amateur use. The reallocation proceeding took so long, however, that UPS eventually pursued other means of meeting its communications needs. UPS entered into agreements with GTE, McCall, Southwestern Bell, and Pac-Tel to use cellular telephone frequencies to build a wireless data network. With the 220–222 MHz band then left unused, the FCC issued parts of the band to other private commercial interests via a lottery in

> *...to allow the amateur service, in exceptional circumstances, to use the band in disaster relief efforts*



Canadian 1.25m Band Plan [15]

The old saying "use it or lose it" certainly holds true in the case of the 220 MHz (1.25 meter) band.

hopes that it would spark development of super-narrowband technologies, which would help them gain acceptance in the marketplace. In the 1990s and into the 2000s paging companies made use of the 1.25-meter band. Most all such use ended by the mid-2000s, with the paging companies being purchased by others and services moved to newer systems or having gone out of business, primarily because of increasing cellular telephone popularity.

U.S. Novice licensees get privileges

By the 1980s, amateur use of 2-meter and 70-centimeter bands was at an all-time high while activity on 1.25 meters remained stagnant. To increase use on the band, many amateurs called for holders of US Novice-class licenses (the entry-level class at that time) to be given voice privileges on the band. In 1987, the FCC modified the Novice license to allow voice privileges on portions of the 1.25-meter and 23-centimeter (1.24–1.30 GHz) bands. In response, some of the bigger amateur radio equipment manufacturers started producing equipment for 1.25 meters. However, it never sold well, and by the early 1990s, most manufacturers had stopped producing equipment for the band.

Scope of operation in North America

Today, the 1.25-meter band is used by many amateurs who have an interest in the VHF spectrum. There are pockets of widespread use across the United States and Eastern Canada, but mainly in New England and western states such as California and Arizona with more sporadic activity elsewhere. The number of repeaters on the 1.25-meter band has grown over the years.[9] Currently there are twelve Canadian and six American repeaters within range of our area, in Surrey, British Columbia. These repeaters exhibit less interference, but also much less radio traffic than comparable 2m and 70cm area repeaters.

The attention that band received in the late 1980s and early 1990s due to the reallocation of its bottom 2 MHz sparked renewed amateur interest. Many amateurs feared that lack of 1.25-meter activity would lead to reallocation of the remaining 3 MHz to other services.[10] Today, new handheld and mobile equipment is being produced by amateur radio manufacturers, and it is estimated that more amateurs have 1.25-meter equipment now than at any point in the past.[11]

Auxiliary stations

An auxiliary station, most often used for repeater control or link purposes or to remotely control another station, is limited to operation on frequencies above 144.5 MHz[12] excluding 144.0–144.5 MHz, 145.8–146.0 MHz, 219–220 MHz, 222.00–222.15 MHz, 431–433 MHz, and 435–438 MHz. Operation of such control links in the crowded 2-meter band is problematic[13] and on many frequencies in that band expressly prohibited, leaving 1.25-meter band frequencies as the lowest available for remote control of repeaters and unattended stations.[14]

Availability of equipment

Since the band is allocated mostly in ITU Region 2 (Somalia, in Region 1, being the only exception thus far), the major equipment manufacturers do not often offer transceiver models that cover this frequency range. This exacerbates the lack of usage of the 1.25-meter band, though manufacturers argue that what equipment they have produced hasn't sold well compared to other products.

In recent years, Kenwood and Yaesu have both included the 1.25-meter band in some of their multiband handheld transceivers. The Kenwood TH-F6A and TH-D74A; the Yaesu VX-6R, VX-7R and VX-8R (USA and Canada version) include coverage of the 1.25-meter band in addition to the more popular 2-meter and 70-centimeter bands. Wouxun now has the KG-UVD1P in a 2-meter / 1.25-meter model, legal for use in Canada and the US. In the 1980s, iCom offered the IC-37A—a 220 MHz, 25-watt FM transceiver that can still be obtained as used equipment from various sources such as eBay and private sales. In 2013, the BaoFeng UV-82X, an inexpensive 2-meter/1.25-meter handheld, became available. During 2021, Baofeng introduced its latest, and cheapest, the UV-5r III handheld transceiver, which now includes the 1.25 meter band as standard.

The Anytone AT-D578UV 144/220/440 MHz FM Tribander

Several 1.25-meter base/mobile transceivers are available. Among these are the Alinco DR-235T, the Jetstream JT220M, BTech UV-2501-220, BTech UV-25X4 quadband, and the TYT TH-9000 monoband radio, which comes in a 1.25-meter model. The Chinese company Wouxun offers a 2 m and 1.25 m dual-band HT, the KG-UVD1P. These have received FCC approval in the United States; but are awaiting approval by Industry Canada. Anytone has incorporated the band on both their handheld and mobile Digital Mobile Radio (DMR) models, along with 2m/70cm bands. Elecraft offers an all-mode (CW, FM, SSB) transverter for the band compatible with its K2 and K3 transceivers.

Despite the loss of a chunk of 1.25m frequencies, radio amateurs still find this band immensely helpful as 2 meters and 70 cm fill with more repeaters and increased QRM. While it is a tiny sliver of the RF spectrum available to ham radio operators, it has seen increased use, particularly for emergency preparedness in the expectation that the 2m and 70cm band will be excessively crowded with traffic in a major disaster.

Technically 1.25 meters is quieter than 2 meters, offers decent propagation, and has a low noise floor. Antennas are relatively inexpensive and easy to build, and they are shorter than corresponding 2m antennas. More equipment for this band is becoming available, especially from Chinese suppliers and with DMR transceivers. A local dealer in our Vancouver (Canada) area offers Kenwood single band units for as little as C$75.[16] You may find 1.25 meters well-suited for your needs.

144/220/440 MHz FM Tribander TH-F6A

The antenna

Having a new band that I did not have before, meant acquiring an antenna. I already have a very good Comet dual-band 2m/70cm antenna on my tower, but the thought of upgrading to a tri-band (and having to lower my HF beam to install it, did not appeal to me.

My new transceiver has only one antenna input so there is a choice: switch antennas by means of an antenna switch or unscrewing them manually… far from an ideal solution, connect a tri-band antenna or use a triplexer. Rather than investing in a new tri-band antenna, an alternative that I will likely invest in is the triplexer. A triplexer is a 4-port filtering device that splits one input in to three different outputs each with a different frequency. It can also be used the other way round and where it routes signals at three different frequencies to a single port. A triplexer enables a single co-axial cable to run into the feed of three different antennas. This bi-directional device typically consists of three bandpass filters with different passband frequencies.

They are available in multiple band combinations, that will permit you to use one radio to connect to three antennas covering different frequencies. Diplexers also exist. These do the same for connecting two antennas to a single dual-band transceiver. For example, I have a diplexer on my Arrow Yagi for working satellites simultaneously on the VHF and UHF bands.

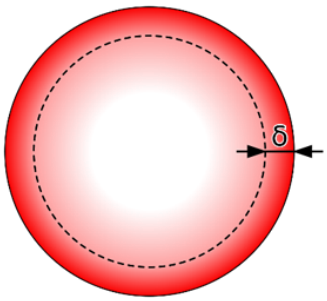
So, instead of buying a new tri—band antenna, I opted to look into building my own single-band 220 MHz dipole. I have built many antennas over the years, and it is an activity that I enjoy. Our basic course also includes an antenna building workshop where students can solder together a roll-up J-pole, then tune it and take it home.

The 'skin' effect

Let me first mention the skin effect, which is the tendency of an alternating electric current (AC) to become distributed within a conductor such that the current density is largest near the surface of the conductor and decreases exponentially with greater depths in the conductor. The electric current flows mainly at the "skin" of the conductor, between the outer surface and a level called the skin depth. Skin depth depends on the frequency of the alternating current; as frequency increases, current flow moves to the surface, resulting in less skin depth.

Skin effect reduces the effective cross-section of the conductor and thus increases its effective resistance. Skin effect is caused by opposing eddy currents induced by the changing magnetic field resulting from the alternating current. At 60 Hz in copper, the skin depth is about 8.5 mm. At high frequencies the skin depth becomes much smaller.

The skin effect has practical consequences in the analysis and design of radiofrequency and microwave circuits, transmission lines, and antennas. The effect was first described in a paper by Horace Lamb in 1883 for the case of spherical conductors,[18]



Distribution of current flow in a cylindrical conductor, shown in cross section. For alternating current, the current density decreases exponentially from the surface towards the inside. The skin depth, δ, is defined as the depth where the current density is just 1/e (about 37%) of the value at the surface; it depends on the frequency of the current and the electrical and magnetic properties of the conductor.

and was generalized to conductors of any shape by Oliver Heaviside in 1885. Applying this to our antenna design, it would seem logical that the greater the diameter (surface area) of the antenna elements, the greater the skin surface resulting in improved conductivity and better antenna performance.

The build

Wanting an antenna that would be sturdy and that would last in our wet west coast environment, I built the dipole using standard 1/2-inch (15mm) hard copper plumbing pipe.

My first step was to calculate the length of a dipole for 223.5 MHz, which is the centre of the 1.25m **working** part of the band. As stated earlier, there is additional 1.2m frequency available but it is reserved for Amateur Radio **emergency communications** in Canada, but not in the United States.

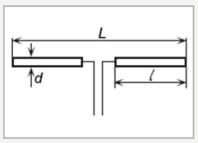
There are hundreds of websites that offer an on-line calculator, but some are incomplete. To obtain a true calculation one needs not only the frequency but also the **diameter** of the elements. It is a factor with all antennas that, the fatter the elements, the shorter the element length and the greater the bandwidth (range of frequencies). I used the calculator at: https://www.translatorscafe.com/unit-converter/en-us/calculator/dipole-antenna. The result is shown above.

My DIY inventory yielded two pieces of suitable length. I also had on hand some surplus 3/4-inch irrigation pipe. I had some lengths of 50-ohm coax and an appropriate connector.

Dipole Antenna Calculator

This dipole antenna calculator determines the size of a simple dipole antenna for a given frequency and the dipole wire diameter. It also determines the wavelength and the length adjustment factor *k*. Note that antennas are very rarely constructed according to the calculated theoretical dimensions and are always tuned to the lowest standing wave ratio (SWR) and the highest electric field strength.

Example: Calculate the full length of the dipole antenna made of 1-inch aluminum tubes for 146 MHz.



Input

Frequency
f 223.5 megahertz (MHz)

Dipole Conductor Diameter
D 16 millimeter (mm)

Calculate | Reset | Share

Output

Wavelength
λ 1.341 m

Half Wavelength
λ/2 0.671 m

Quarter Wavelength
λ/4 0.335 m

Total Dipole Antenna Length
L 0.64 m

Dipole Leg Length
l 0.32 m

Adjustment Factor
k 0.954

A quick trip to the local home supply store for a 3/4-inch PVC ‘T’ connector rounded out my supply list.

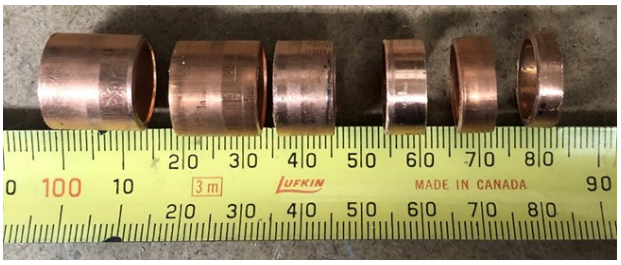
I cut two pieces of pipe to measure 13 inches (33.5 cm) as per the calculation.

I then threaded the coax through the mast portion of the ‘T’ and slid the elements into the sides using some PVC pipe to provide a solid fit. The coax was split, and spade lugs and screws were used to provide a good electrical bond to the elements. Before I mount the antenna outside I will wrap the entire ‘T’ with a good self-amalgamating rubber vulcanizing tape, covered by a quality black electrical tape, to waterproof the connection.

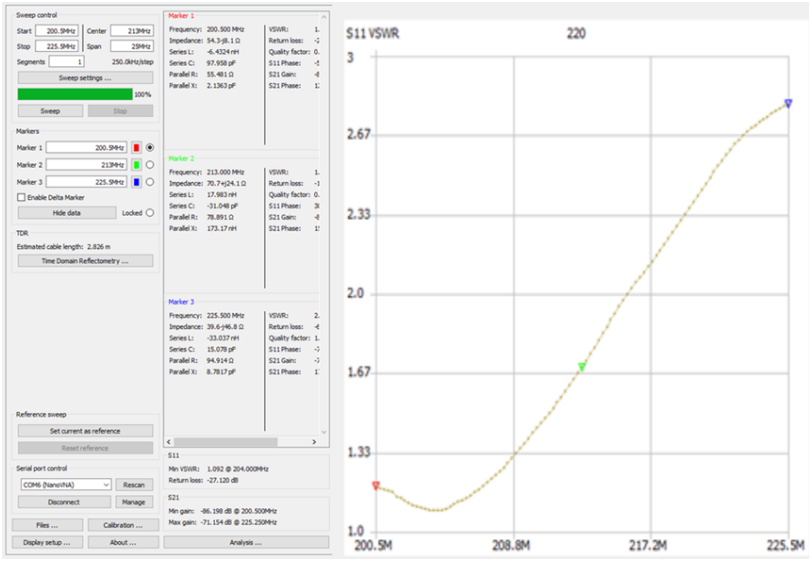
Note that there was no matching required from the coax to the dipole. Calculating the impedance (Z) match Z=R±jX, I noted that R was about 50 Ω and X was ~0 so that satisfied me about resonance.

The 1.2m dipole antenna as measured to the specifications in the formula.

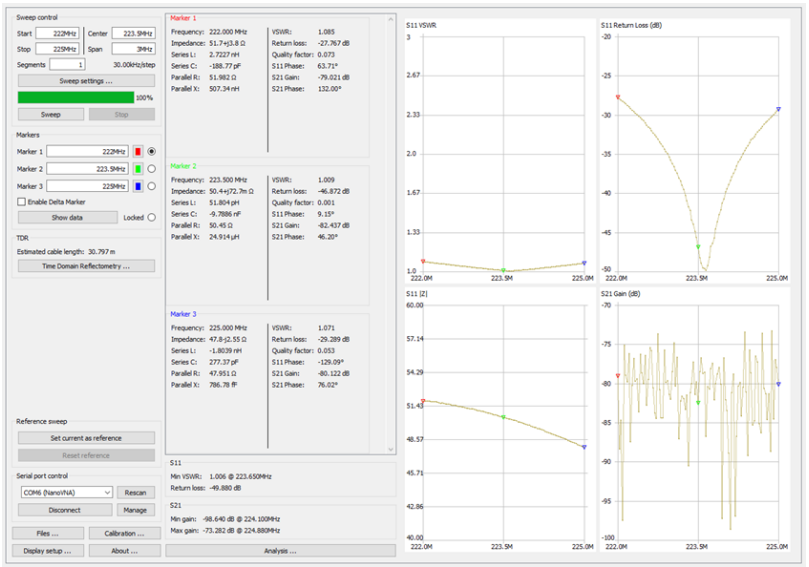
Now to measure and confirm the formula. It became quickly apparent that the calculation was not what I was seeing on the antenna analyzer. I started to trim… first taking off 1cm lengths and gradually less to come closer to the desired 1:1 across the band. I finally achieved a 1.009:1 match, enough to make this a very useable antenna, and I confirmed it by contacting the VE7SAR club 220 MHz repeater locally. I did find that there was little traffic on the local 220 repeaters, confirming the conclusions in the foregoing section of this article.



Successive trim cuts to bring the dipole to resonance. A tubing cutter makes this task relatively simple.



The first NanoVNA measurement of the untrimmed antenna. The elements were at the length prescribed by the formula. Note that the best SWR is almost the ideal 1:1 at about 204.5 MHz, well below the desired frequency, indicating the elements need shortening. Note also that Marker 1 (in red at the top) indicated near 50 ohm impedance at 200.5 MHz.



Here is the analyzer reading once the dipole was properly trimmed. At the target centre frequency of 223.5 MHz we show an impedance (Z) of 50.45Ω and an SWR reading of 1.009:1, not bad! The impedance remains within ±2Ω of

50Ω across the band. Note also the bandwidth as shown in this screenshot. The SWR is below 1.1:1 between 222 and 225 MHz, which is the desired working portion of the band.

Why was the calculation so far off?

I was puzzled. I expected the calculation to be reasonably accurate, but not so far off that I had to cut off almost 2.5 inches (6 cm) from each side! As stated earlier, I knew that antenna length would decrease with element diameter but this seemed excessive. I consulted three other 'senior' hams, who also serve as Elmers in our group, for their opinion. All had been involved with their own antenna projects in the past. All confirmed my thoughts about diameter vs length.

Kevin VE7ZD commented that: "I do have a book from 1961 called "Lines, Waves and Antennas" by Brown/Sharpe/Hughes,[17] and it discusses the issue of element diameter versus wavelength in dipoles. Following the discussion, I get a divergence of reactance from that of an "optimal" element diameter (presumably infinitely thin elements) of 0.009, which seems to correspond to an increase in about +100 ohms of antenna reactance for these thick elements. My guess is that this would mean that the elements would have to be shorter to compensate for this increase.

Wavelength for 220 MHz is 1.36 metres, 1/2-inch elements are 16 mm in diameter (or 0.016 metre), so the ration (they call it R0) is 0.016/1.36 to give 0.0118, which I looked up in the book's "Reactance of a cylindrical dipole referred to the driving point".

Kevin forwarded the question to Dennis VE7BPE/AC7FT, a Ham friend of his in Portland, OR. Dennis is an antenna engineer and offered the following explanation: "Looking at this design there are a couple of things. First, there is an extra length of the coax after it splits to each element. That is part of the radiating length. It's also acting as an impedance transformer. Second, the resonant frequency (the point where the reactive part of the antenna impedance becomes zero) isn't always the point of lowest SWR. SWR is a magnitude only measurement. Impedance is a vector value, it has a real and imaginary part. The SWR is related to the hypotenuse of the distance between the actual impedance and the reference impedance. You can be at resonance but still have a bad SWR. For example if the impedance trajectory goes close to 50Ω, but is still reactive (has an imaginary part) but the actual resonance resistance (real part) is 25Ω, then at resonance it will have a 2:1 SWR. I would have to show you on a Smith Chart to make it clearer.

Also, when the diameter get larger compared to the wavelength, the antenna does need to get shorter. The nominal equations are for an infinitely thin wire. Like you said there are some corrections. The older ones could be based on measured data and normalized. The best way with modern technology is to get a copy of NEC2 or something later. It is a numerical antenna solver. You can put in actual diameters of the conductors. NEC4 would be the most accurate. You can then simulate it. Of course if you have access to something better like HFSS you can use that too.

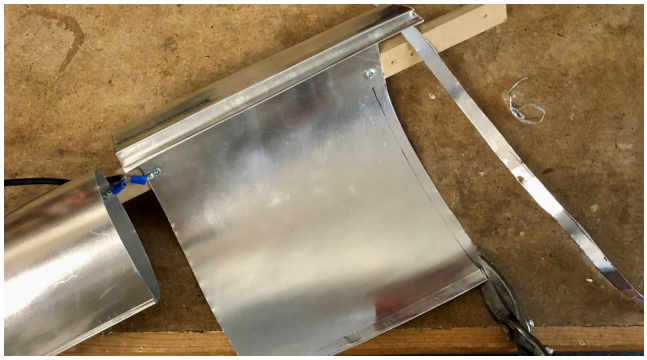
I looked at "Balinis, Antenna Theory Analysis and Design" to refresh myself. The equations given for a dipole is based on an infinitely thin conductor. This is already an approximation of the current distribution on the wire.

You must solve for the current distribution before you can get the radiation pattern or input resistance. You can't even solve for the reactance unless you solve for the near field effects. After that it must be done numerically. You have to break the conductor into segments and solve for the current in each segment. This is what NEC and friends do.

Looking at Balinis, there are no solutions for anything other than an infinitely thin wire. For a finite diameter you need to use a numerical method. They introduce the Method of Moments to compute the properties of a finite diameter dipole.

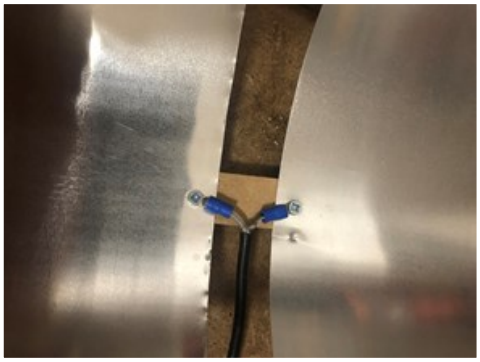
So my solution would be to accept the measured value. Assuming there are no extra losses, it would probably work well. Otherwise use NEC and compute it. Again, trim to make it work."

The first SWR plot for the 4" ducting dipole.



Left and below : Ducting cut to size as per the formula

Bottom left: The two elements fastened to a wooden boom and the coax attached.



So… Kevin and I decided to test the concepts discussed by constructing a set of 220 MHz antennas, all centered on 223.5 MHz *[see Kevin's article starting on page 14]*. Stan VA7NF, who presents the antenna module of our basic course, has talked about having built an 80m vertical antenna using 4-inch pipe. With this in mind, I volunteered to take it to an extreme for our antenna, using 4-inch HVAC duct.

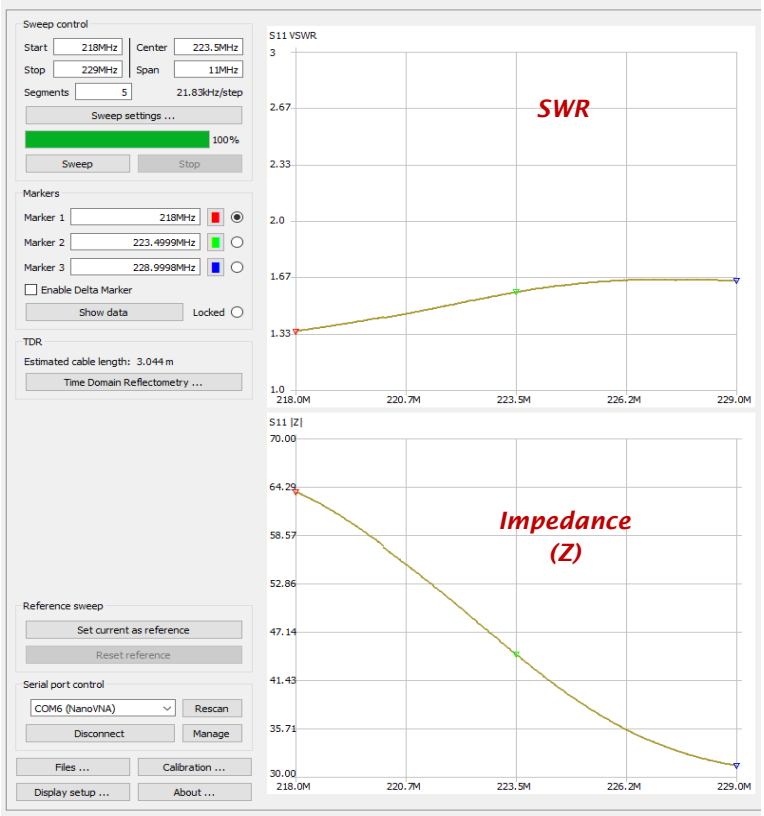
The best analyzer reading showing an almost flat SWR curve averaging ~1.5:1 across the entire 220 MHz band (and beyond). Note that the range is set 10 Mhz either side of the center frequency in the photo photo *[below right]*, so SWR with the RigExpert was less than 1.5:1 from 213.5 to beyond 233.5 MHz.

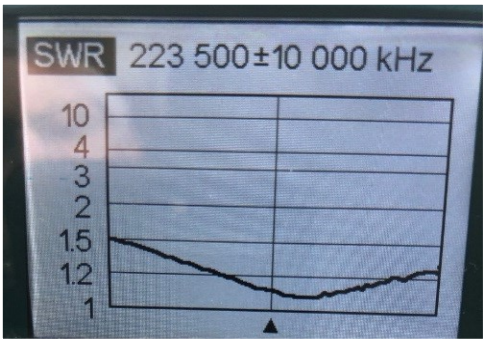
You have to 'zoom' out a lot before you can see a significant dip in the curve, indicating a very wide bandwidth. Interestingly, flattening the duct on the dipole produced almost identical readings with only slightly higher SWR.

I should probably have quit there. But, this was an experiment and, like a teen trying to get a few more RPM from their hot-rod, I kept trimming to try for further improvement. I trimmed too much and the SWR went up, so the final measurement *[below left]*, though still good, is slightly worse.

But the conclusion was clear… Thicker elements do shorten a dipole and broadens bandwidth!

~ John VE7TI





For the 4-inch ducting dipole, the RigExpert (above) and NanoVNA (left) SWR plots centered on the middle of the 220 MHz band.

The bandwidth displayed above is 20 MHz, and on the left it is 11 Mhz, both well beyond the edges of the 1.2m band.

The reading above was for the dipole trimmed to ~8.7 inches (22 cm) per side. The reading on the left was the 'final' result with the elements cut to 8 inches (20.5 cm) per side.

Here are the two antennas. 1/2 inch elements on the top, and 4 inch elements below, for an approximate size comparison.

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HAM NEWS

From the Amateur Radio World

Amateur Radio ban – Ukraine

Ukraine has declared a state of emergency in all of Ukraine except for eastern Donetsk and Luhansk oblasts starting on February 24th.

The parliament approved the decree introduced by President Volodymyr Zelensky on Feb. 23, as the threat of Russia's all-out invasion of Ukraine continues to grow.

Donetsk and Luhansk oblasts already have a special legal status because of Russia's ongoing occupation since 2014. Restrictions introduced by the state of emergency are due to last 30 days and will vary depending on the region. The state of emergency allows the authorities to temporarily limit the public's constitutional rights.

The decree green-lights the following measures:

- increased public order protection and security;
- checks of identification documents of civilians and frisking if necessary;
- ban on protests;
- temporary or permanent evacuation of people from dangerous areas and providing them with accommodation;
- ban on relocation of conscripts and reservists without notice;
- ban on producing and spreading information that may "destabilize the situation";
- **ban on amateur radio transmitting devices.**
- Other measures that may be implemented "if necessary" include:a curfew;a special regime of entry and exit;ban on mass events;"special rules" for spreading information online.

Source: https://www.dx-world.net/amateur-radio-ban-ukraine/

~ Southgate Amateur Radio News

Message from Anatoly Kirilenko UT3UY of the Ukrainian Amateur Radio League

Dear friends,

Early this morning russia launched a war with Ukraine.

Military facilities and airfields in some cities, including Kyiv, were shelled.

Also Ukraine was attacked from the east from the territory of russia, from the north from the territory of Belarus, from the south from Crimea.

Thanks from Ukrainian citizens to USA, Great Britain, Canada, Poland, Baltic countries, Czech Republic, some EU countries for help and weapons.

Martial law has been imposed in Ukraine today.

There is a ban on the operation of amateur stations in Ukraine for 30 days beginning today.

Anatoly Kirilenko, UT3UY
Vice-President UARL

...more

Antenna Adventures

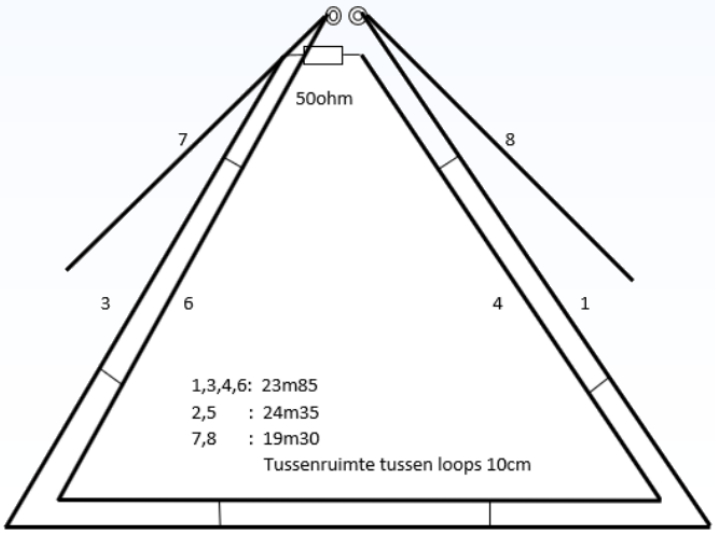
Sander van der Haar PD9HIX

A Delta Loop for 80-160 meters

The plan

The world has been gripped for a while by a virus, which means that a lot is changing around us, and we are forced to stay at home more. My boss also instructed me to work from home as much as possible. Quite a punishment if you are a radio amateur and also like to do some tasks in the context of the hobby! Since there is very little to do for me remotely and my job is almost at a standstill, I had planned to spend that time well to build an antenna, that had been on my wish list for some time: a Delta Loop for 160 and 80 meters.

A Delta Loop for 80 has been suspended in my garden for a long time. I thought could use those suspension points for my new design.



The old design comes from the well-known book by Karl Rothammel; the antenna therefore works super well at 80. The feed point hangs at a height of 14 metres, while the other two points are at a height of 3 metres. In this configuration, an NVIS antenna is created that covers the whole of Europe. But… then you still don't have 160. Of course, with an antenna tuner, you can compensate for the mismatch, but that is not ideal.

I often think about such things for a long time, and it brews in my head before an idea pops up that may or may not be useful. For example, I was once clicking on the world wide web and came across a double Delta Loop. Double, two next to each other. I started to think about that. I actually wanted to integrate those two loops. I was sketching it out at first, but then I wanted to draw it a little better. First a rough sketch on paper, then in the antenna design and calculation program MMANA-GAL. First the original design of a single Loop, then a second one next to it. At first it seemed like nothing. Changing the spacing of the two Loops did not achieve much result. After I had put it away for a while, I picked up the program again and started experimenting. With the laptop on my lap, lots of coffee, and many further attempts, I finally came to the design on the left.

Forgive my artistic ability. I'm more of a practitioner.

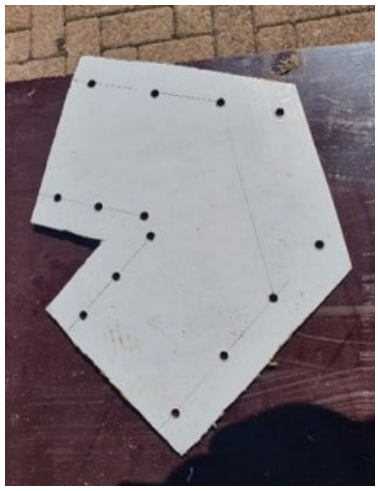
So much for the idea. Now for the execution! So, I already had a Delta Loop hanging. With the premise: “No sense re-inventing the wheel,” I let that antenna down a bit so that I could easily reach it. Then I traced the contours of the corners on cardboard. This was my starting point.

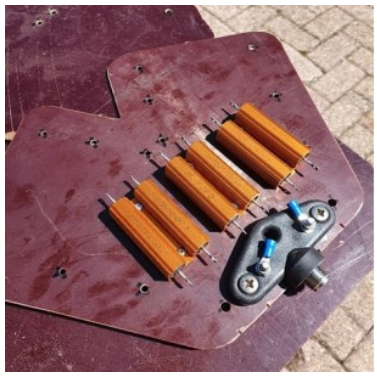
As you can see *[top right]*, I punched several holes in the cardboard with a hollow tube. These holes are made to thread the wire through. By applying this threading method, the wire stays in place and is prevented from sliding. Also, the proper angle of the antenna is guaranteed. The measurements in the above drawing are measured down to the first hole of the corner distributor (as I call them), so the total length increases even more.

The holes of the inner run are 4cm apart. The outside run has the holes at 5 cm and the span to the other side is 15 cm. So, the inner run becomes 2x4+2x4=16 (x3 corners) or 48cm longer, while the outside run is 2x5+15+2x5=35 (x3 corners) or 105cm longer. According to the calculation program, the ideal space between the radiators is 10cm, I therefore adopted that size.

I still had a large sheet of mica (another solid non-conductor would do) on which I traced the cardboard pattern and sawed out three pieces with the jigsaw. Holes drilled at half a millimeter larger than my wire thickness, and the corners rounded so that they look a little better. I also drilled two extra (somewhat larger) holes on the 'base' of the plates to insert a rope through them so that it can also be hung. But more about that in the following pictures *[middle photo]*.

Of course, the antenna must be fed with a 50 ohm coax and so I chose to set up a wire antenna connection (dipole / SO239 feed point). You immediately see the resistance that I had already drawn in the diagram, because to get good performance from the antenna over both bands, proper termination resistance is important.





The calculator told me that a value of 50 ohms is ideal. You see six resistors *[photo bottom right]* mounted on the plate, but that was because I had started building a little too enthusiastically. In the end I chose to put five pieces on it, 250 ohms / 100 Watts each. I have connected these five resistors in parallel to provide 50 ohms that will tolerate 1000 watts of power without breaking down. Theory says that a third of the applied power can go into the resistance, but practice (experience with other antennas with terminating resistors) teaches me that this often reaches half. With a maximum transmission power of 400 Watts, a 200-Watt resistance should be enough, but I chose to stay on the safe side.

Antenna wire

Which wire is usually used for wire antennas? After an hour of reading on the internet and many suggestions, I have not become much wiser. No one uses the same thing or gives a clear answer. Rothammel's Antennenbuch doesn't give me much clarity either, so I fell back on my old familiar product: WD1TT.

WD1TT is a wire that I learned about during my service. It is extremely strong (we towed cars with it!) and it has a good conductivity. There is a nice jacket around it and, because it is black and thin, almost no one sees that I have antennas suspended. With a pull force

Thread wire by wire through the holes in the mica plate.

rating of 95kg per single line, this is strong enough for any wire antenna one may wish for. WD1TT is the abbreviation of Wire Double in 1 Twice Twisted. Double in 1 means that there are 4 copper wires and 3 stainless steel wires in one jacket. Twice Twisted means that it is a double performance. Now there are two types of this again. The type where there are actually two pieces more or less sloppily twisted together, and the type that it looks more like a twin cord. Years ago, I was able to buy version two at a dump. Two rolls of one mile each. I thought for the time being enough to be able to make some antennas.

Above: Nylon cord has been used as a fastener. To prevent shifting, the wires are secured afterwards by gluing them to the mica plates.

Left: The base plate with the terminating resistors and the SO-239 connector.

Building / construction

Now that all the preparations have been done, it is time to build the actual antenna. A bit of space is needed for this.

That is why I drove some poles in the front yard and used an old tree as a base.

Then I started threading wire by wire through the holes, as can be seen in the photos. In the photos you can also see that I use a nylon cord as a fastening device. That can also be seen once finished (when I was sure of a functional antenna!) I more or less glued the wires to the mica plates. This was because I still had to hang the antenna and I did not want the wire to possibly shift.

The base plate

In the photo *[bottom left]* you can see the final base plate. The resistors are connected, and on the outside of the plate you can see the dipole that is connected directly to the connections. Mind you, I built this antenna like this now, but in the end, I turned it all around. So, the resistors are now at the bottom of the plate to prevent weather influences. I put it together in such a way that I could easily get to all the connections, instead of having to fiddle 'upside down' every time.

For spacers I used pieces of 8mm carbon fibre tubing left over from another antenna build (evenly spaced along the sides of the loop, two per side) sealed with some caulk. I used the same caulk for the corner brackets.

The dimensions of the final antenna are shown in the first drawing. At first, I only used these measurements as a guide. The calculation program does give a length, but from experience I've learned in the meantime that it is better to make the wire a bit longer, and to shorten it afterwards because adding a piece

Top: The spaces were evenly divided over the length of the three sides.

Bottom: The antenna in the test position.

of wire is simply not practical… By means of an AA600 antenna analyzer from RigExpert and matching software AntScope2, I could display the results.

Testing

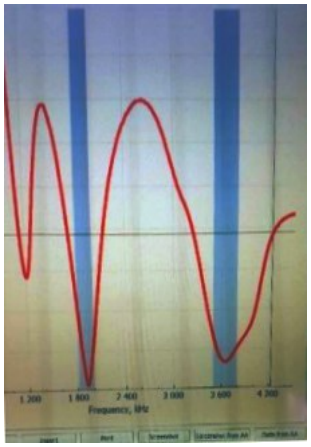
At the first antenna test, despite making sure I wasn't near the antenna and knowing it was hanging way too low, I was still a bit disappointed in the result.

The good news was that there was a dip. Not yet on the frequency I wanted, but shall we say it had potential. After some extra calculations to move the dip to the desired frequency, I shortened the antenna. I folded the excess wire back and stretched it next to the radiator. I once learned that a return wire has no effect on antenna operation. The result was already looking better. After much trying, shortening, and reconnecting, my experimentation seemed to yield the desired result. Initially I wanted to do without the dipole, but for better radiation and SWR, this turns out to be the better solution. Now we had to decide on a length, and I also spent a day with that. And I was not dissatisfied in the end, especially keeping in mind that the SWR would improve as soon as the antenna went up in the air.

The measurements

I couldn't understand why I couldn't get rid of that weird bump in the 80m band, until I realized that I had folded back meters of wire and taped it to the radiators. Because I had not seen too much difference with the last adjustments, I decided to cut off everything that was excess and connect the antenna without it. After all, an automatic tuner in the set would filter out the leftovers… After I finished the antenna by soldering on terminals, heat shrink tubing and some sealant here and there, it turned out that what I had once learned was not true after all. It **does** matter whether your excess wire is folded back or cut off! My learning moment was that at first, I folded the wire back, but I now know that it only improves as soon as you cut it off.

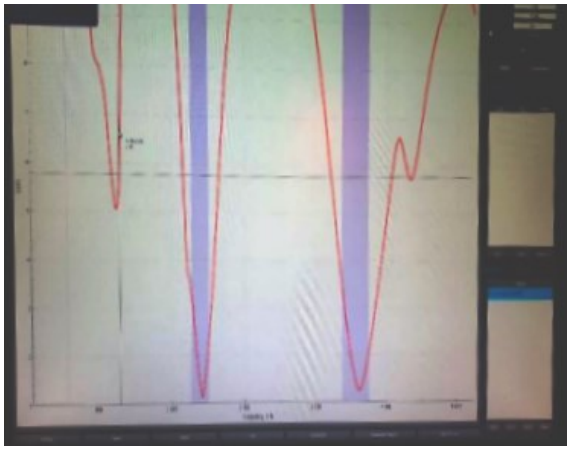
The result after trimming is clearly visible in the photo, taken from the screen of my laptop, with the antenna hanging in the garden (at 1m height) and thus a field measurement as it were. By cutting the wire, the dip in



Far left: The result with folded back excess wire.

Left: The result after trimming the excess wire.

Right: The end result with the antenna fully raised.



the 160m band slides up and in the 80m band the bump disappears, so the antenna has only become better.

Satisfied with the result, it was now time to raise the antenna to the intended height. It was easy to lift the base plate to the desired height of 14m with a pulley on the mast. I had been careful that I had to turn the antenna in its entirety first, so that the resistors and connections would end up at the bottom. First, spray the plate with hairspray to ward off moisture as much as possible.

At a sufficient distance apart, I have support poles with a couple of small pulleys at 3 and 4 meters high. I pulled some tension ropes through them and thus raised the corner dividers to height. The corner dividers go to a height of 3 meters, and the two dipole legs go to the same poles, but at a height of 4 meters. Everything taut, and the coax through the wall into the shack. I chose Aircell7 for the feed line. I still had it lying around and it is a good coax for HF with little loss. I plugged it in and was ready for the final measurement.

And this is why I did it all. What a great result! (May I congratulate myself?) Both dips are just where they should be, right in the middle of the band and, because the antenna is at the correct height, the SWR is also nice and low. All in all, a great antenna, and because it is suspended at an angle, there is great NVIS operation. Higher in the bands the antenna is worthless, but it wasn't intended for that either.

In closing

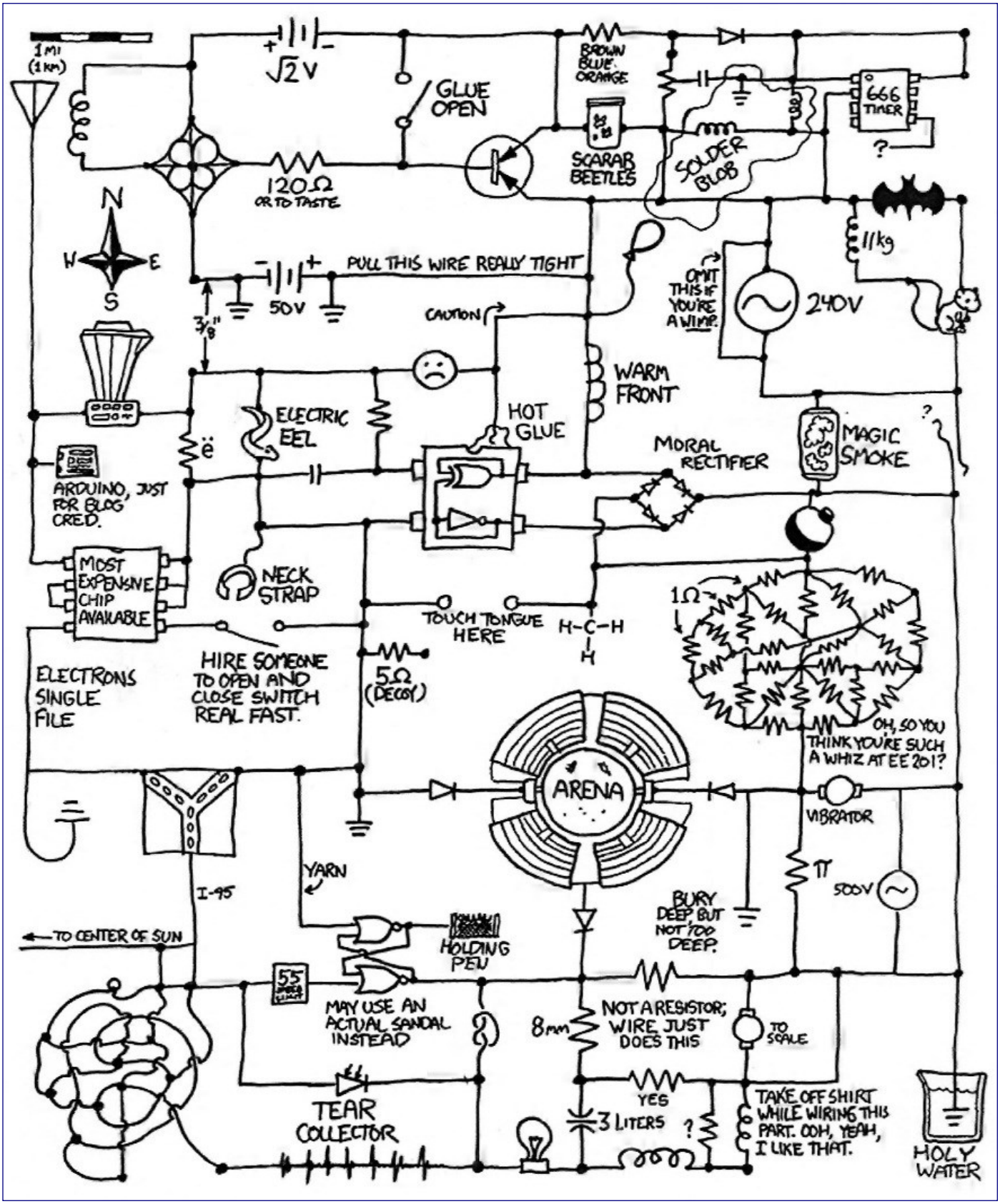
Now readers may wonder why an N-amateur (Netherlands Basic certificate) spends so much time making an antenna that he is not allowed to use to transmit. That's right… But I am also a member of the PI4RS Scouting association (Radio Scouting). And as a group we regularly use my shack and antennas. I have the advantage to have a bit more space around the shack and therefore I have more and especially larger antennas up. Incidentally, obtaining the full license is also on my to-do list.

When we started using the delta loop as PI4RS, the results were very satisfactory. The delta loop is therefore a true improvement for our antenna farm. There are not many 160m antennas as they simply take up a lot of space. This one requires a lot less, but it still works very well.

The antenna has been up for over a month now and the performance so far is very positive. I have noticed that it is a requirement that it is kept taut, otherwise the wires tend to twist in strong wind. At first, I didn't have it very tight, but I've changed that now and it doesn't twist anymore.

As the author of this article, I think I have covered everything, but there must be something I missed. If there are DIY readers who want more information on assembling this antenna, do not hesitate to send me an e-mail: mailto:pd9hix@hotmail.com?subject=80-160%20Delta%20Loop.

~ Sander PD9HIX

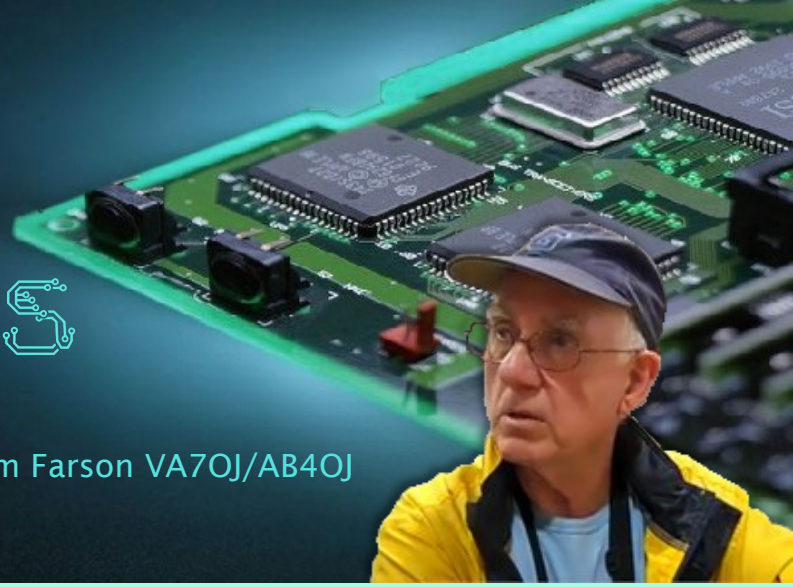


A SARC "Project of the Month" - Which software package will simulate this? See page 57

The Communicator

...more

TECH TOPICS



Adam Farson VA7OJ/AB4OJ

Automatic Antenna Tuners & Couplers

1. Introduction and Purpose

The purpose of an automatic antenna tuner (auto-tuner) is to transform (match) a complex load impedance to 50Ω resistive, and to maintain the matched condition automatically as the operating frequency and load impedance vary.

This will assure optimum RF power transfer, correct transmitter LPF termination and best PA linearity (Ref. 1) over a reasonably wide range of transmit frequencies and load-impedance variations.

When matched, an automatic antenna tuner will tune out the reactive component of the antenna system impedance and transform the radiation resistance of the antenna radiator to 50Ω resistive at the transmitter output. This will ensure maximum transfer of "real" power to the radiator.

The automatic antenna tuner receives band/frequency information either from the associated transceiver, or by measuring the RF drive frequency. The actual tuning operation is controlled by detectors at the input to the matching network. These detectors provide information on the matching condition to the control electronics, which adjust the matching-network constants to achieve the required match.

Automatic antenna matching systems, once found exclusively in exotic military and commercial HF equipment, are now commonplace in affordable amateur-radio gear.

2. The two basic tuner types

- T-network tuner with limited matching range
- Π/L-network coupler with wide matching range

2.1 The T-network autotuner

In its simplest form, this tuner consists of a T-network with capacitive (C) series arms and an inductive (L) shunt arm. The T-network autotuner normally has a coaxial input and output, and is designed for connection to a coaxial feedline. Its matching range is usually limited to a maximum VSWR excursion of 3:1 (16 ~ 150Ω resistive) to 50Ω resistive, although it can be extended by switching in additional L and C values.

2.2 The Π/L-network automatic coupler

This type of tuner consists of a switchable Π-network with capacitive shunt arms and an inductive series arm. The input is connected via a 50Ω feedline to the transceiver, and the output via a short single-wire feeder to the

feed-point of the radiator. To increase the matching range, the network can be switched from a Π to an L topology by switching out the output shunt capacitance.

This type of coupler is intended to match random-length radiators such as whips and long-wires to 50Ω resistive. It can accommodate complex loads with a very wide impedance range, from tens (λ/4) to thousands of ohms (near λ/2). The limiting case is λ/2. Odd multiples of λ/8 are recommended, e.g.3/8-wave, 5/8-wave, 7/8-wave etc.

3. T-network autotuner considerations

3.1 Capabilities, limitations and expectations

As mentioned in 2.1, the T-network autotuner is intended to match loads having a maximum VSWR excursion of 3:1 (16 ~ 150Ω resistive) to 50Ω resistive. It is designed to match near-resonant antennas such as LPDA's, multi-band verticals, tri-band beams etc. The limited-range T-network design does not have the matching range to accommodate random-length mobile whips or wire antennas, or non-resonant doublets fed via balanced line. We cannot simply connect our ladder-line-fed 80m doublet, 40m long, or our coat-hanger, to a T-network auto-tuner via a 4:1 balun and expect it to tune all bands. This is especially true of the internal auto-tuners found in many popular HF transceivers.

3.2 T-network topology

It is not our intent to go into the mathematics of these networks; there is an excellent T-network tuner simulator (courtesy W9CF) on the Web, which displays L and C values (and insertion loss) for any combination of load impedance and frequency. We should note here that whilst a classical T-network manual tuner will match a very wide range of complex loads to 50Ω resistive, the limited selection of L and C values in a typical internal or accessory T-section autotuner will limit its matching range as per 3.1 above.

Alternatively, download the archive for the tuner simulator here. Install the Java runtime if required, and run the tuner.jar file locally. Please refer to the readme file.

Typically, the capacitive (C) series arms are air-variable capacitors driven either by DC servomotors or by stepper motors. Relay-switched fixed capacitors are switched in parallel with the variable capacitors as required, to extend the matching range. The inductive (shunt) arm has a modest number of bandswitched taps.

In some low-power portable designs, a series of relay-switched fixed capacitors arranged in a binary or 1,2,5 sequence takes the place of the motor-driven variable capacitors. To conserve primary power, latching relays are used throughout the tuner.

The inductive (L) shunt arm consists of a tapped inductor with a relay contact connected between each tap and chassis ground. Each relay closure corresponds to a particular band or frequency range, and shorts a part of the inductor (more turns shorted for higher frequency and vice versa.) The inductor usually consists of ferrite-cored toroids for the lower bands, and air-wound coils for the higher bands;

When matched, an automatic antenna tuner will tune out the reactive component of the antenna system impedance and transform the radiation resistance of the antenna radiator to 50 ohm resistive at the transmitter output.

the relay contacts are connected to the junctions between coils. Some designs utilise a motor-driven wafer-type rotary shorting switch instead of a series of relays. (Portable low-power equipment uses latching relays to conserve primary power.) A motorised roller-inductor is used in some higher-powered tuners.

The inductor(s) in an antenna tuner should be dimensioned for a reasonably high unloaded Q, so as to minimise insertion loss and heat dissipation in the coil(s).

Caution: Roller-inductor tuners are the most troublesome of all outboard tuners. The maintenance factor aside, "hot-tuning" roller-inductors is a serious concern for solid-state transmitters, and even to some degree the older more rugged vacuum-tube transmitters. The problem with these tuners is that the electrical continuity between the roller, the spring-loaded rod on which it slides and the coil seldom remains optimum, especially whilst the roller is in motion. SWR spikes occurring during tuning of roller-inductors are a well-known cause for damage to solid-state transmitters. Thus, a roller-inductor tuner should be adjusted at the lowest practicable RF power level, or even with an antenna analyser rather than the transmitter.

3.3 Minimum practical match

Most modern solid-state transmitter PA's start to reduce output for load VSWR > 1.5:1.

Elecraft KAT100-2 Automatic Antenna Tuner

This feature is known as foldback SWR protection. Accordingly, the ability to match down to VSWR < 1.5:1 is a design objective of every automatic antenna tuner. Manufacturers' specifications usually state the minimum match point as VSWR < 1.2:1.

3.4 Tuning time

This varies with the design of the tuner; typical values are 1 ~ 5 sec. to reach the match point after selecting a new band, and < 1 sec. to rematch after an in-band QSY.

3.5 Internal and external (accessory) versions

Many modern solid-state HF amateur transceivers, and almost all current solid-state HF amateur linear amplifiers, incorporate an integral T-network auto-tuner. In addition, external T-network tuners are available as accessories for transceivers and solid-state amplifiers not fitted with an internal tuner. These units receive band-selection data from the associated transceiver. Some models cover HF and 6m.

3.6 Power rating, insertion loss and power dissipation

Typically, an internal auto-tuner as fitted to a transceiver or amplifier is rated at the parent equipment's output. An external accessory auto-tuner for a transceiver is rated at 100 to 150W CW or PEP. It is obvious that the network components in a tuner for a 1 kW amplifier will be much larger, and considerably more expensive, than those in a 100W transceiver's internal tuner. Note: When transmitting into a load which presents VSWR > 2:1 to the auto-tuner, it may be necessary to de-rate the tuner to avoid overheating. This applies especially to "key-down" modes such as CW and RTTY.

High and medium power external auto-tuners are now available from Palstar and Elecraft. These tuners are rated at 1.5 and 0.5 kW respectively.

The insertion loss of the T-network when matched is typically 0.5 to 1 dB (6.25 to 12.5% of input power). The auto-tuner compartment of a solid-state HF amplifier is fitted with a cooling fan, as 0.5 dB insertion loss equates to 125W dissipation in the T-network at 1 kW output to the load.

The insertion loss when not matched will be higher; increased RF currents in the L and C elements, and higher RF voltages across capacitors, will yield higher losses. These will increase the power dissipation in the network. For this reason, the tuner should be designed (and allowed) to match as close as possible to unity VSWR.

3.7 The T-network tuner as receiver preselector

In most current HF amateur transceivers, the auto-tuner is in the RF signal path on receive as well as transmit. Furthermore, if the tuner in a solid-state amplifier is enabled, it will be in the RF signal path in operate and standby modes. The T-network will contribute some additional RF preselection to the receiver front end. This is especially true in the case of an amplifier; to reduce insertion loss, the inductor Q in the high-power auto-tuner is quite high. (Note: The transceiver's auto-tuner should always be disengaged when driving a solid-state amplifier.)

3.8 T-network tuner control methods

In an automatic T-network tuner, three RF circuit elements must be controlled; the shunt L arm and the two series C arms. As mentioned earlier, control of the L value is fairly simple in an amateur application; we select the correct L tap for the band in use. Band information from the transceiver is decoded to set the bandswitch or relay group to the correct tap. In some designs, the band information will cause fixed capacitance to be added to the C arms to cover lower bands.

A servo (feedback) loop controls the series C arms. A detector at the T-network input passes error voltages to the servo controller. The controller, in turn, drives the tuning-capacitor motors or capacitor-bank selection relays. The tuning process commences when initiated by the operator, or when VSWR > 1.5:1 (typically); it continues until the error-voltage outputs of the detector fall to zero. At this point, the servo controller stops the tuning process. The loop time constants are chosen for optimum damping without overshoot.

Some automatic T-network tuners support dynamic tuning (re-matching automatically when load VSWR exceeds 1.5:1 or 2:1); other designs require the operator to initiate a new tuning cycle (static tuning).

3.8.1 Detectors: Most T-network auto-tuners employ a reflectometer (VSWR detector) and a phase detector (Ref. 2) at the network input. Each detector supplies an error voltage. The optimum matching point (both error voltages zero) corresponds to VSWR = 1.0:1 and RF voltage &

The insertion loss of the T-network when matched is typically 0.5 to 1 dB (6.25 to 12.5% of input power)

current in phase. One design uses a reflectometer and a return-loss bridge. It initiates coarse tuning with the reflectometer, and then switches in the return-loss bridge for fine tuning. An HF discriminator embodying |Z| and phase detectors is also encountered. *(Ref. 2, p. 595-6)*.

A minimum RF power input is required to ensure that the detectors develop a sufficiently high error voltage to allow accurate matching. This is typically 5 ~ 10W for a 100W auto-tuner, and at least 75W for a 1 kW tuner.

4. The Π/L-network coupler

4.1 Capabilities, limitations and expectations

As mentioned in 2.1, this type of coupler is intended to match random-length radiators (such as whips and long-wires) to 50Ω resistive. It can accommodate complex loads with a very wide impedance range, from tens (λ/4) to thousands of ohms (near λ/2). The limiting case is λ/2; in fact, the coupler will not match an exact half-wavelength or multiple thereof.

The Π/L automatic antenna coupler is designed to be installed in close proximity to the feed-point of the antenna radiator, and connected to that point via a short single-wire feeder*. It is not intended to match a near-resonant antenna fed via a coaxial feedline. The coupler can also be configured to match symmetrical antennas such as non-resonant doublets fed via balanced line. This will require floating the coupler above RF ground, and decoupling its RF feedline and power/control cables using RF chokes.

When a Π/L coupler feeds an asymmetrical random-length antenna, it is imperative that the coupler's "cold" (RF ground) terminal be connected to a good ground or counterpoise system. In vehicular, shipboard or aeronautical installations, the ground terminal must be bonded to the chassis or to a substantial metallic part of the structure.

Note: As the feeder forms part of the radiator, it must be as short as practicable.

4.2 Π/L network topology

Typically, the input and output shunt C arms consist of a series of relay-switched fixed capacitors; the series L arm is a tapped inductor with relay-switched taps. The relay contacts short out one or more sections of the inductor as required. The inductor is often made up of ferrite-cored toroids for the lower frequency range, and air-wound coils for the upper frequency range; the relay contacts are connected to the junctions between coils. The network covers the entire 1.8 ~ 30 MHz HF range continuously; some designs cover 1.8 to 60 MHz. High-power couplers often incorporate a motorised roller-inductor.

To extend the frequency coverage and impedance-matching range, either the input or the output shunt C arm can be switched out, thus reconfiguring the Π network as an L network. In a typical design (the SGC SG-230), a total of 26 network-component selection relays provide a network having 64 values of input shunt C, 32 values of output shunt C and up to 256 values of series L. (Ref. 3, p.40).

4.3 Minimum practical match

Manufacturers' specifications usually state the minimum match point as VSWR < 2:1. Read these antenna-coupler FAQ's.

4.4 Matching time

Random set time (key-up to "Tuned" signal): 2 ~ 4 sec. Recurrent set time (rematch): < 10 msec.

4.5 Power rating, insertion loss and power dissipation

Π/L automatic couplers are available from various manufacturers with power ratings ranging from 5W to 500W. The insertion loss of the matching network when matched is typically 1 dB.

The insertion loss when not matched will be higher; increased RF currents in the L and C elements, and higher RF voltages across capacitors, will yield higher losses. These will increase the power dissipation in the network. For this reason, the coupler should be designed (and allowed) to match as close as possible to unity VSWR.

The Icom AH-4 inserts an attenuator ahead of the matching network, to prevent "hot-switching" of the network relays and minimise radio interference during tuning. This coupler also shuts down its microprocessor when tuning is complete, to eliminate EMC problems.

4.6 Π/L automatic coupler control methods

In a Π/L automatic coupler, three RF circuit elements must be controlled; the input and output shunt C arms and the series L arm. As the coupler does not receive explicit frequency data from the transceiver, the coupler's microprocessor controller counts the frequency of the RF signal applied to the input. The frequency information, and error signals from detectors at the network input, are passed to the controller. The controller, in turn, sets the L and C selection relays in the matching network, configuring it in Π or L as required. It also controls the roller-inductor drive motor (if fitted).

The tuning process commences when initiated by the operator, or when VSWR > 2:1 (typically). The controller sets up successive L/C combinations in accordance with a matching algorithm, as a function of RF signal frequency. This process continues until the error-voltage outputs of the detectors fall to zero. At this point, the servo controller stops the tuning process, and signals the operator that tuning is complete. These settings are held pending subsequent changes in frequency and/or load parameters. For a more complete description, read Ref. 3, p. 41.

When RF is re-applied to the coupler in a new transmission, the coupler checks the frequency and load parameters, and initiates a new tuning cycle if required.

4.6.1 Detectors: As well as a frequency counter, a typical Π/L automatic coupler utilises a reflectometer (VSWR detector), an impedance bridge (load impedance detector) and a phase detector (Ref. 2) at the matching-network input. Each detector supplies an error voltage to the controller. The optimum matching point (both error voltages zero) corresponds to VSWR = 1.0:1, 50Ω resistive load impedance and RF voltage & current in phase.

4.7 Physical construction and installation of Π/L coupler

As the Π/L automatic antenna coupler is designed to be installed in close proximity to the antenna feed-point, its electronics are enclosed in a weatherproof, high-impact plastic housing.

iCom AH-4 Tuner

The housing is sealed with watertight cover gaskets and cable-entry fittings; in some cases, an internal desiccant pack is provided. The RF output terminal is mounted in a large, ribbed ceramic insulator. Very high RF voltages can appear at the coupler output, particularly when feeding radiators whose electrical length approaches λ/2.

The output terminal is connected to the antenna feed-point via a single-wire feeder. This feeder forms part of the radiating system, and should thus be as short as practicable and kept clear of any metallic object. The 50Ω coaxial feedline and power/control cable are brought back to the transceiver location. Ferrite RF chokes may be fitted to the cables at the coupler end, as required.

For further protection from a hostile environment, manufacturers recommend mounting the coupler undercover - for example, under a hood, in the trunk of a car, or on an inside bulkhead closest to the antenna feed-point in marine applications.

Ref. 3 offers a wealth of installation information. Although SGC-oriented, much of the material is applicable to any coupler.

5. Tuner control schemes

5.1 Historical development

Early automatic T-network antenna tuners used analogue circuits (operational amplifiers, comparators and servomotor driver amplifiers) to translate the error signals received from the VSWR and phase detectors into variable voltages which drove the two tuning-capacitor motors. Starting at a default setting initially preset by the operator, the motors turned until the correct matching point was reached (error-signal voltages = 0). Any change in frequency (within a band) or load impedance initiated retuning. Band selection was accomplished by manual bandswitching, or via band data received from the transceiver. The band data set the band-selection relays, or the third (bandswitch) motor, to the correct inductor tap. Examples of this type of tuner are the Icom AT-150 and AT-500.

An automatic antenna-selection switch, programmable by band, was an attractive feature of many of these auto-tuners.

Early Π/L-network couplers, initially developed for military applications, employed servomotor-driven vacuum variable capacitors and roller-inductors, controlled by analogue circuitry receiving error signals from a reflectometer and phase detector at the coupler input, as discussed in Section 4 above.

5.2 Microprocessor control

The next step was to replace the analogue controller with a microprocessor. The detector error signals drove analogue/digital converters (ADC's) which, in turn, fed data to the processor. Digital/analogue converters (DAC's) converted digital output data from the processor into analogue signals which drove the servomotors. (Example: Icom IC-765). In later and current designs, stepper motors and their associated drivers have replaced the DAC/motor driver/DC motor combination.

iCom IC-765

The microprocessor also translates band data from the transceiver into coil-tap relay settings. (Examples: Yaesu VL-1000 and Icom IC-PW1 HF/6m amplifiers). The processor stores each new match point in memory, and retunes the tuner settings to the match point closest to the selected frequency range.

5.3 Internal vs. external tuners

Most popular amateur HF transceivers are now fitted with an internal automatic T-network tuner. As a result, the demand for external tuners has declined in recent years. Despite this, many excellent external units are available from manufacturers such as LDG Electronics, Palstar and MFJ, and also on the used market.

Elecraft offers the KAT500 external autotuners for its KPA500 solid-state HF power amplifier.

An internal tuner receives DC power, RF drive and band data from the transceiver in which it is mounted. An external tuner requires 12V DC (or mains) power, RF drive and band data from the transceiver to which it is connected. The band data protocol is proprietary; Icom uses a 0 ~ 8V analogue band-setting voltage, whilst Yaesu and Kenwood use a 4-bit binary code.

External accessory automatic tuners for the Icom IC-706 series, IC-7000 and IC-7100 (IC-AT180), Kenwood TS-50 (AT-50) and Yaesu FT-100D (FC-20) are current products.

5.4 Protective features

In a solid-state HF linear amplifier with internal T-network automatic tuner, a reflectometer is sometimes fitted at the tuner output. This circuit reports the VSWR at the interface to the feedline. If VSWR > 3:1 (as in the case of a sudden antenna failure), the reflectometer will force the amplifier off-line, thus preventing any possible damage.

6. Conclusion

6.1 When should I use an automatic antenna tuner or coupler?

A T-network automatic tuner is appropriate when the antenna system's maximum VSWR excursion in any band is 3:1 or less. A Π/L-network automatic coupler, mounted at the antenna feed-point, is ideal for automatic matching of random-length (non-resonant) wire or vertical antennas over a wide frequency range (1.8 ~ 30 MHz).

6.2 When am I best off with a manual antenna tuner?

A manual T-network tuner may be most suitable when matching a non-resonant wire antenna such as a doublet or loop with a balanced-line feeder (open-wire or ladder line) over a wide frequency range. A balun is required to interface the balanced line to the unbalanced T-network output; a balanced tuner is an alternative. See 3.2 above.

iCom IC-7000 and LDG AT-7000 autotuner

6.3 Why will an automatic coupler not match an exact half-wave?

Is this because of the very high voltage which appears at the end of a half wave, or because of the very high impedance at that point? How close to a half-wave is matching possible? The problem lies in the very high impedance presented by an end-fed half-wave. It is simply out of range for the matching network in the coupler. Icom, SGC and other manufacturers all caution against attempting to tune a half-wave radiator; the coupler will see it as an open circuit, and dangerously high RF voltages will be developed across matching-network components.

A manual L-network tuner with a large roller inductor and wide-spaced air-variable capacitor can withstand these high voltages much more easily than the small relay contacts, ferrite-core and close-wound air inductors and silver-mica capacitors typically encountered in an automatic coupler. Odd multiples of λ/8 are optimal, e.g. 3/8-wave, 5/8-wave, 7/8-wave etc. Practical "safe" limits are l < 0.4λ and l > 0.6λ(or odd multiples thereof.)

6.4 Cascading internal and external tuners, a "no-no"!

A transceiver's or amplifier's internal auto-tuner must be disengaged when using an external tuner. Cascading tuners can reflect high reactance values back into the auto-tuner and/orLPF bank. As a result, dangerously high RF voltages can appear across capacitors in these networks, leading to component failure.

6.5 Do I need to use the transceiver's tuner when driving my amplifier?

The answer is: "That depends…" When driving a solid-state amplifier or many grounded-cathode tube amplifiers, the exciter's internal auto-tuner should be disengaged. It is not needed, as these amplifiers almost always have a frequency-independent 50Ω resistive input impedance.

When driving a grounded-grid tube amplifier, the transceiver's auto-tuner will often yield a better match to the amplifier's tuned input networks, especially when operating an older "non-WARC" linear on 17 or 12 metres. As a general rule, the exciter's auto-tuner should be engaged if VSWR > 1.5:1 at the amplifier input.

6.6 Common misconceptions and problems surrounding automatic tuners:

- "I have connected a single-wire-fed inverted-L to my antenna socket, and my tuner won't tune." No, it won't; please remember the VSWR < 3:1 limitation referred to above.
- "I don't need to use the tuner, because my VSWR is only 2:1." Wrong, on 2 counts; firstly, the PA is folding back the output significantly when it sees a 2:1 VSWR*. Secondly, Ref. 1 is quite emphatic about a 50Ω resistive load as a precondition for good PA linearity.
- "I installed my IC-706 Mk IIG and AT-180 in my van, and ran the coax back to a 102-in. whip at the rear. It doesn't tune." Wrong tuner type. You need to install an AH-4 in the rear of the vehicle, close to the antenna base, and remove the AT-180.
- "I have just engaged the tuner, but now my receiver is deaf as a post." Try pressing the [TUNE] button, or making a brief transmission to set up a match point at the frequency in use. You may be surprised at the result.

*In the unlikely event that the PA lacks SWR foldback protection, let's see a 2-tone test at full power into a 2:1 VSWR load on our spectrum analyser!

~ *Adam Farson VA7OJ/AB4OJ*

7. References:

1. "HF Radio Systems &Circuits", Chapter 12, Sabin & Schoenike, editors. Noble, 1998. View excerpt
2. "HF Radio Systems &Circuits", Chapter 15.
3. "SG-230 Smartuner Installation & Operations Manual", SGC Inc. Download Mirror

8. Links

1. Home
2. Icom FAQ
3. Icom America
4. Yaesu USA
5. Kenwood USA
6. LDG Electronics Inc.
7. SGC, Inc.
8. VSWR, Return Loss, Reflection Coefficient & Matching Loss
9. Lossy, Mismatched Transmission Lines
10. K6OIK's Mysteries of the Smith Chart
11. K9EQ's AH-4 Home Page
12. Auto-Couplers, by KØBG
13. The Autotuner as Preselector
14. Antenna Tuners, by W8JI

9. Acknowledgements

I am indebted to my good friend Matt Erickson KK5DR for encouraging me to write and post this article.

Adam is a member of the North Shore Amateur Radio Club (NSARC), and has written a number of articles on a variety of subjects.

You can find them at Adam's website: https://www.ab4oj.com/

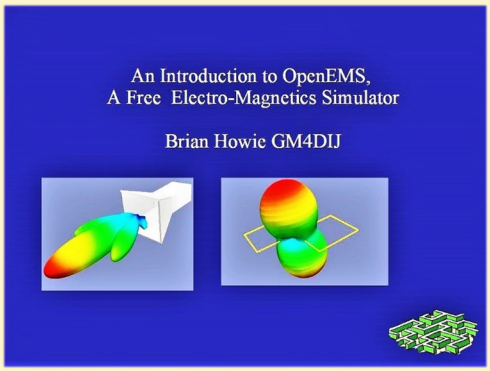
OpenEMS…

From the Lothians Radio Society: "OpenEMS is a free and open electromagnetic field solver using the Finite Difference Time Domain method. It was created by Thortsten Liebig at the General & Theoretical Engineering University in Germany. FTDT is a time-domain approximation of Maxwell's equations to calculate the results.

Clck for the report

For the presentation video

~ Lothians Radio Society



The Communicator

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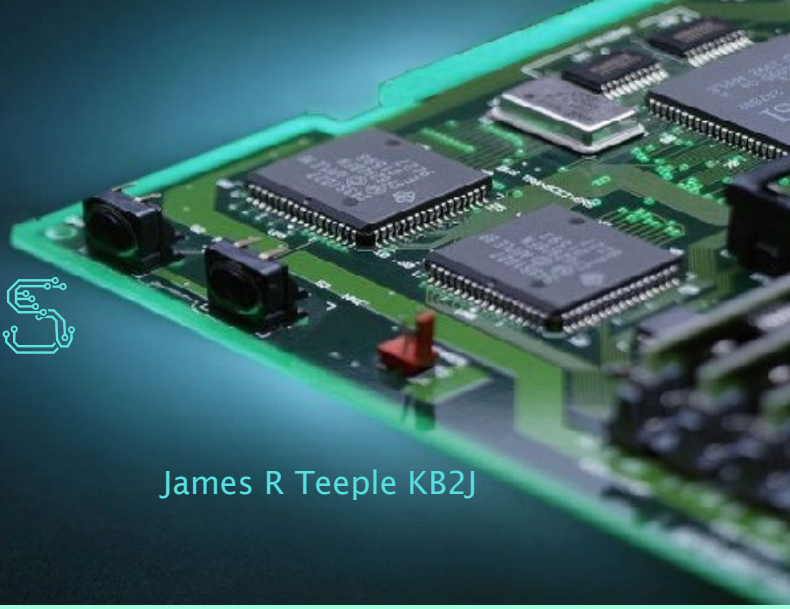

James R Teeple KB2J

Determining RFI problems in mobile installations

Some vehicles just can't be quieted down, no matter what you do. Even vehicles which are otherwise identical, can have different levels of RFI. They're sort of the lemons of the amateur mobile world. If someone ever figures out why this is so, they'll become over-night millionaires!

Hybrids, especially those from Toyota, are some of the RFI noisiest vehicles money can buy (as are plug-in vehicles). There are just too many digital signals to deal with, along with all of those of a standard vehicle when the engine is running. John Pavelich VE3XKD, has spent untold hours of labor, and a wad of hard-earned cash getting his Prius quiet enough for HF work. Few amateurs possess John's, seemingly unending patience, to take on such a formidable task!

Hybrids and plug-ins aren't the only ones either. Some of the newer common-rail diesel engines emit enough RFI to drown out the best of signals.

It may help to bond the trunk and hood, and possibly even the doors to the vehicle's frame. Shown is a braided grounding strap.

Yes, you could use split beads on the offending injectors, if you could get to them! In most cases, they're hidden under the intake manifold and/or under sound insulating covers. This negates the use of split beads, even if you could get to the harness to apply them.

If possible, before buying any vehicle, take along a portable AM radio. Tune off a station, and listen to the background noise level. Then start the vehicle. If the background level comes way up, check other similar vehicles on the dealer's lot to see what they do. While subjective, you'll at least have a feel for what you're up against.

Troubleshooting Your Power Supply

If you continue to experience noise in your receiver when the coax has been disconnected from the antenna connection, your source more than likely RFI coming through the radio's power supply. The best way confirm this is to disconnect the radio from the car's 12-volt power and supply it from an external dc power supply. If the noise disappears, then you have confirmed this, and it takes time to investigate exactly how your radio is drawing power from the electrical system. See how you have treated each of the following potential RFI sources in your installation:

Connections To The Battery

It is always advisable to draw your power directly from the battery, connecting through the firewall to the battery terminals using good heavy gauge wire suited for this purpose and available at most ham outlets and electrical supply houses. When connecting directly to the battery you achieve three benefits:

You prevent the possibility that your negative connection may be "floating" above RF ground. Using convenient body sheet metal connections inside the passenger compartment may allow RFI to be introduced into the receiver and should be avoided.

You will benefit from the tendency of the natural capacitance of the battery itself to aid in the suppression of RFI, which may be conducted along the wiring harness.

You avoid piggybacking a 20-amp supply into your fuse block. Running the rig at full power on a tap on the air conditioner circuit, for example, is not advised and will regularly blow fuses and create hazardous stress on a line that was not designed for this purpose. Even if you have a free spot on the block open you still won't be able to benefit from the preceding two items described above.

A nice touch involves replacing the bolts fastening the terminal clamps to the battery with longer ones. Attach ring-tongue lugs to the power supply wires and slip them on to the additional bolt lengths and secure with appropriate flat and lock washers and double nuts to prevent loosening due to vehicle vibration. The extra bolt length will also afford room to supply your FM rig or other "always-on" accessories. Cover any part of the exposed positive bolt to avoid sparks during under-hood work. As an aside here, when your cabling is mounted in this fashion you create an excellent facility for attaching jumper cables to boost your car when necessary, just remember the radio is now connected directly to it and disconnect the power lead from the radio before you boost!

When routing the power line through the firewall keep it away from heat sources, moving parts and, of course, any other harness wiring which may represent an RFI source which, through inductive coupling, may allow noise into your power supply. If possible, drilling a dedicated hole specifically for passing through your power line is the most ideal option. Place it as far away from other wiring as possible, and prepare the hole with a grommet to avoid abrasion of the insulation. After placing the wire, weather-seal the hole with silicone caulk.

One very important point: Both the negative and positive leads from the battery should be fused. Many mobile hams do not appreciate that, should the battery become disconnected from it's engine block ground during service, the car's electrical system could seek a path to ground through your radio, both destroying your rig and presenting a high-current risk to your safety. Although the risk may be a rare one, it is nevertheless cheap insurance and a snap to apply.

Alternator and Regulator Interference

Almost all of us know alternator-induced noise when we hear it. It appears as a high-pitched whine whose tone increases and decreases in step with the speed of the engine and when lights or other heavy current draws are switched on. Generally most alternator whine is grounded through the natural filtering capacitance present in the battery. If you jumped right to this section, you might want to roll the page up and read the previous section in which this phenomenon is addressed.

Alternator whine, when viewed on an oscilloscope, is actually AC ripple in the rectified DC output and can be received through the vehicle's wiring. If you still have objectionable noise of this nature present in the receiver check your battery for loose connections or corrosion. Also check, if you can, along the length of the harness from the alternator to the battery as there may be loose connections along the way there as well. Sometimes when digging this deep

it is helpful to take the car to the auto center and ask the technician to run the length of the cabling with you with the option of putting the car up on the lift, if need be. In especially noisy cases you may even wish to check the yellow pages for the location of an electric motor refurbishing firm who can give your noisy beast a checkup.

Generally the manufacturer includes a capacitor within the alternator itself for noise suppression. Another capacitor in parallel will provide for more suppression. A commercially available RF noise suppression capacitor is fine to perform this task.

Filtering Power Supply Leads

Finally, many commercially-made noise suppression filters are available at most radio and auto supply stores. These are designed to fit in the power leads between the battery and radio. They are inexpensive and easy to install and actually work quite well.

~KB2J

New postage stamps feature Amateur Radio in Greece

Hellenic Post (ELTA) has released a special set of four postage stamps featuring amateur radio in Greece. A post by the National Amateur Radio Society of Greece (RAAG) says:

We would like to inform you that, on the occasion of the opening of the Radiocommunications Station of the General Secretariat for Telecommunications and Post of the Ministry of Digital Governance, the Hellenic Post will release a booklet of 4 Self-Adhesive Personal Stamps which will be available from Tuesday, February 15, 2022. Five thousand (5,000) pieces will be produced.

See the RAAG post at https://raag.org/radioerasitexnismos-ellada-stamps/

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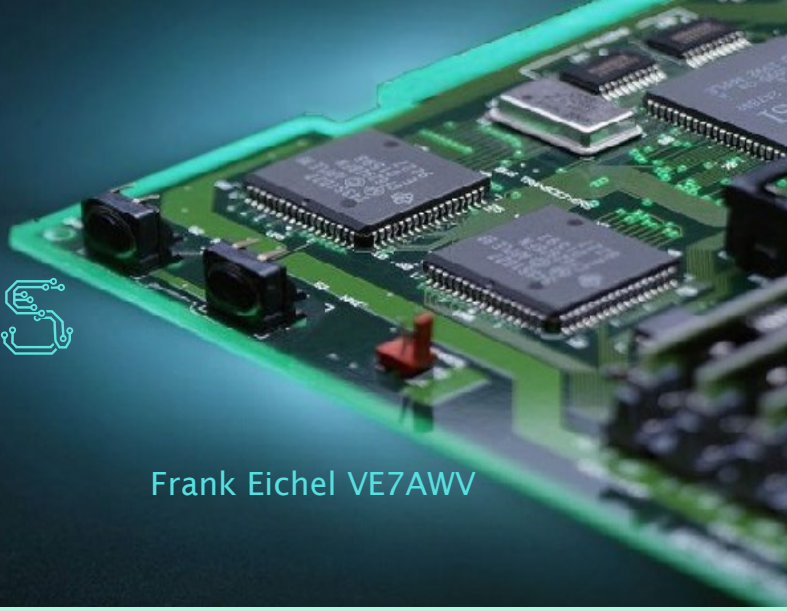


Frank Eichel VE7AWV

Curing Washing Machine Interference

Ham radio operators everywhere are facing an ever-increasing level of electromagnetic interference as the number of switch mode power supplies and appliances driven by variable-speed drives increases in homes. Interference from switch mode power supplies is widely known and universally condemned as these units usually lack filtering to save manufacturing cost and are typically running all the time. It is very difficult to single out an interfering unit without switching off all the home's circuit breakers and then checking each unit as the circuits are switched back on. On the other hand, interference from washing machines and dishwashers is quite a bit easier to identify as the interference emanating from these machines can be easily correlated with their cycle of operation.

For years I have been plagued by interference from our washing machine, a Kenmore Elite front loader (model 11047852703). When it is operating, it shows a very distinctive pattern of evenly spaced interfering signals on my SDRUno panadapter (Figure 1 below). As you can see, this interference is certainly strong enough to block the weak DX signals I am looking for!

I tried to quell the interference by wrapping the machine's power cord a number of times through a large mix 31 clip-on ferrite (Fair-rite 0431177081, Figure 2). There was some improvement but certainly not enough to completely kill the interference as Figure 1 clearly illustrates. Since I was only at the ham shack on weekends, I decided to work around

Figure 1 - Washing machine interference showing as white vertical stripes in a panadapter waterfall.

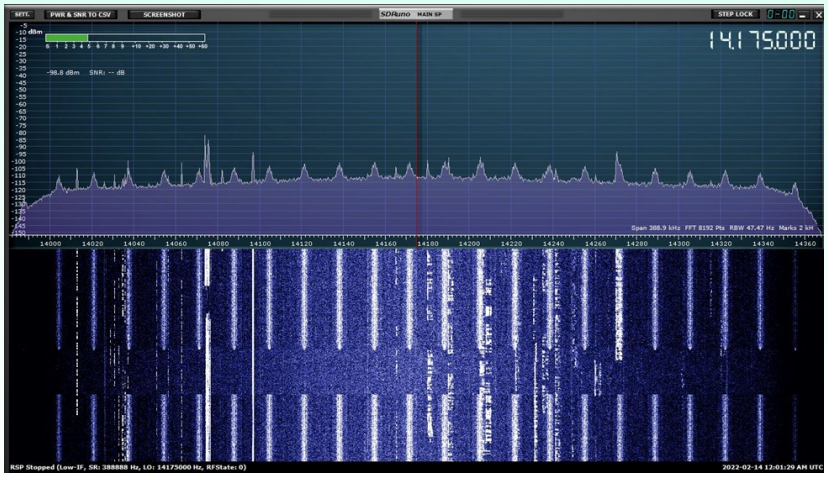


Figure 2 - Mix 31 clip-on ferrite on power cord.

Figure 3 - Original filter; and Figure 4 - The replacement filter.

the interference by simply not operating while the washing machine was running. I thought nothing more of it as, after all, the machine had been built in Germany and, surely, they had used suitably designed components to prevent such interference.

Now that I am retired and spending more time on the radio, I decided to have a second look at the problem. I discovered from the parts diagram for my machine that it has a noise filter installed close to where the power cord enters the cabinet. I decided to buy a replacement filter thinking that the one in the machine might be defective, thus allowing the interference to be conducted out of the machine and radiated by my home's wiring. The replacement for my machine is Whirlpool part number WPW10367632 which replaces the original part number 8183019.

Installing the new noise filter was quite easy after the top cover of the machine was removed. Once connected and bolted in, I ran a rinse cycle to check for signs of interference on the panadapter. To my complete surprise, the interfering signals did not show up at all! They were gone! I was very happy at the outcome.

Having solved the problem, I decided to dig a little deeper to find out why the interference no longer appeared. The original filter is shown in Figure 3. It is made by Iskra at a manufacturing plant in Slovenia. When I visited the company's website, I could not find this particular model in its catalogue.

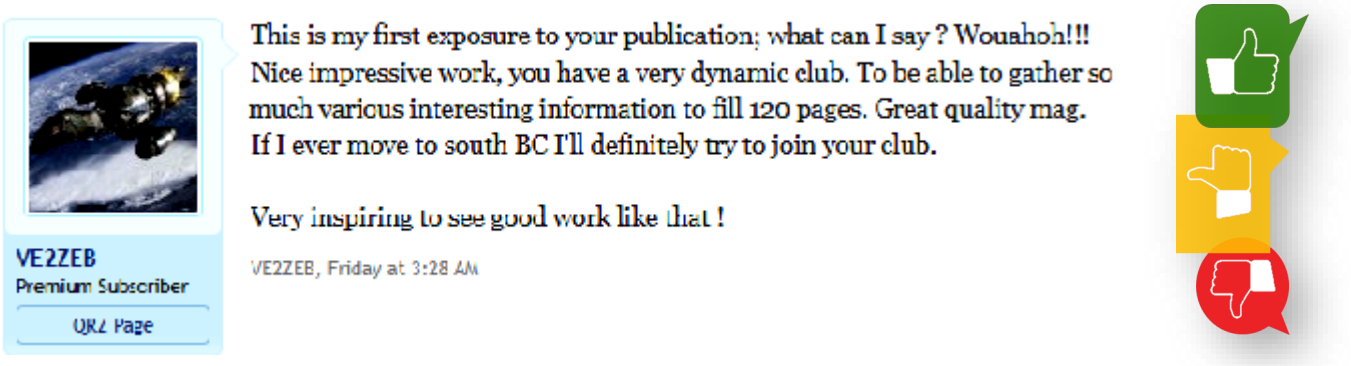
I then took a closer look at the replacement filter that I had purchased (Figure 4).

This one is made in China by Ningbo Bical Industry. If you look closely at the schematic diagram shown on the label and compare it to the schematic shown on the original filter in Figure 3, you will see that they are quite different. Going back to the Iskra website, I was able to find an updated version of the original filter in their catalogue that uses the same circuit shown on the Whirlpool replacement part I had purchased. In fact, the replacement part made by Iskra shows up on the Sears Parts Direct website.

So, if you are plagued by washing machine interference like I was, you might solve the problem by replacing the noise filter in the machine.

Now, if I could just as easily solve the interference from my dishwasher.

~ Frank VE7AWV



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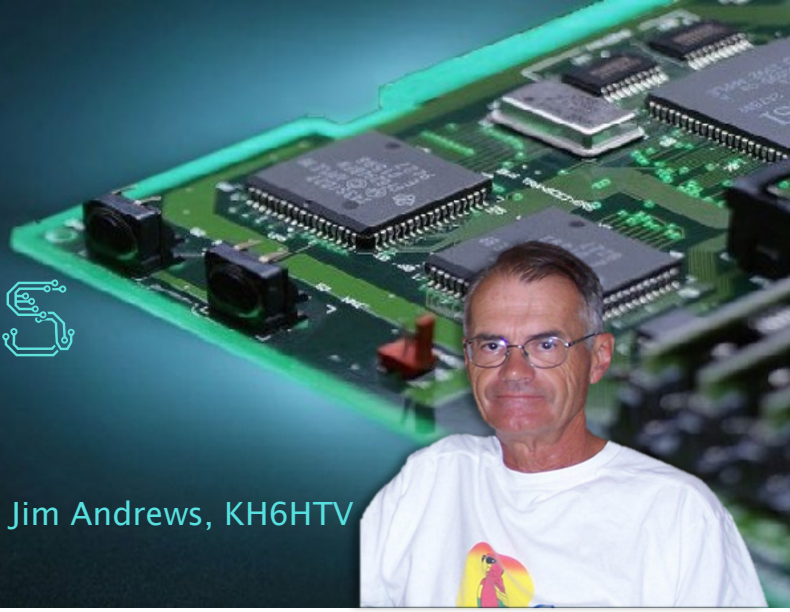


Jim Andrews, KH6HTV

Circuit Simulation Software

On a recent BATVC ATV Thursday afternoon net we got into a lengthy discussion comparing various circuit simulation tools. Jim, KH6HTV, was trying to design a narrow 70cm band-pass filter. He was using a version of SPICE called LTspice. Steve, WA0TQG, then took Jim's circuit and modeled it with a much more exotic simulator called QucsStudio. Both Jim and Steve demonstrated their simulator results on the ATV net by connecting their PCs to their TV modulators.

Both simulators are free shareware. Here are the URL links to both.

- **LTspice:** LTspice is given away free by the semiconductor manufacturer Analog Devices. https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html
- **QucsStudio:** QucsStudio is being developed by Michael Margraf, DD6UM, in Germany. http://qucsstudio.de/

SPICE

SPICE was originally developed at the University of California - Berkeley, and introduced in 1973. It was originally developed to design integrated circuits. It uses a nodal analysis and performs a transient analysis. It can handle non-linear devices. SPICE performs several different analysis. They include:

- DC (for quiescent point determination),
- AC (linear small signal),
- transient (time domain,
- large signal solutions of both linear and non-linear devices) and
- noise analysis.

Wikipedia gives a good description of SPICE.

A commercial version, PSPICE, was my (kh6htv) first serious computer aided circuit analysis tool. Back in the mid 80s when my company, Picosecond Pulse Labs, purchased our first Dell PC ($4K in 1980 dollars!) we also bought PSPICE and paid an arm and a leg for it of several K$. But it rapidly paid for itself by giving us the ability to design better products.

Today, Analog Devices gives away this same tool free under the name LT-Spice. The LT stood for Linear Technology. In the 80s, one had to describe the circuit by writing lines of code with each line detailing an individual component and the node numbers describing where it was connected in the circuit. Today, Analog Devices includes an easy to use program to draw your schematic diagram on your computer monitor screen and it then automatically generates the lines of code, called a net list, needed by SPICE.

When you then run the spice simulation, Analog Devices gives you a probing tool to look at either voltages or currents. The display then is either as an oscilloscope for transient analysis, or as a network analyzer for AC (frequency domain) analysis.

QucsStudio

QucsStudio is a free circuit simulator environment that operates under Windows. It is a non-commercial project that is developed completely privately but is supported by an active forum of users/developers. It has a graphical user interface where you draw a schematic and include the type of simulation(s) and result diagrams desired. It is intended as a universal platform for multiple simulators and contains the following simulators:

- Non linear: Similar to Spice and can perform DC, AC, noise and transient analysis of a circuit and has the capability to import a Spice netlist. Like Spice this uses an iterative approach to find an operating point solution and can be a bit touchy and slow.
- S-Parameter: This is a linear RF simulator that is based on creating an S- Parameter matrix for each part and then combining these to reach a closed form solution. This allows using parts that are defined using industry standard S-Parameter files that are available from many RF part vendors or creating your own files by measuring a part using a vector network analyzer. A good library of standard parts is available that includes lumped components as well as several types of transmission lines. This simulator has the advantages of being very fast and flexible for RF circuit analysis as well as noise figure analysis.
- Harmonic Balance: This is a non linear RF simulator that creates a solution for the harmonic levels for circuits such as amplifiers and mixers and includes large-signal AC and noise analysis.
- Digital: This is used to create truth tables and/or timing diagrams for digital circuits and can import industry standard Verilog or VHDL files.
- System: This simulator works in the digital domain and components are modeled by sampling at a high rate of speed relative to the system bandwidth. This is useful in simulating communication systems and circuits, in the presence of noise, to determine overall performance.
- Electro-Magnetic field: This is a simulator that can work with a microstrip transmission line circuit and can create a more exact simulation using the Electro-magnetic fields. Also available are the ability to perform real time component tuning, parameter sweeps, Monte Carlo analysis, optimization and an equation capability with a rich supply of functions The optimization capability is particularly useful for creating RF filters and matching circuits when taking all circuit parasitics into account where a synthesis program cannot create a proper circuit. The system also contains several useful tools for creating inductors and capacitors, an extensive variety of filters, attenuators, transmission lines and matching circuits.

Having so many capabilities can make the program a bit intimidating at first but once you learn the basics for the type of simulation you wish to perform it is an easy to use and vary powerful tool. Although I am by no means an expert at all of the programs capabilities (I mostly use the S-Parameter simulator) I am certainly willing to help anyone that would like to learn to use the program.

~ Steve, WA0TQG, Boulder, Colorado

Reprinted courtesy of the TV Repeaters Repeater newsletter

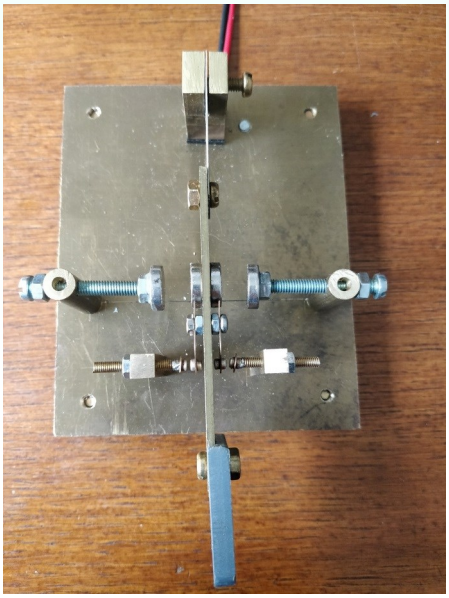
Ham Hardware

Luc ON7DQ

The ON7DQ Woody Cootie, and making a baby… Cootie

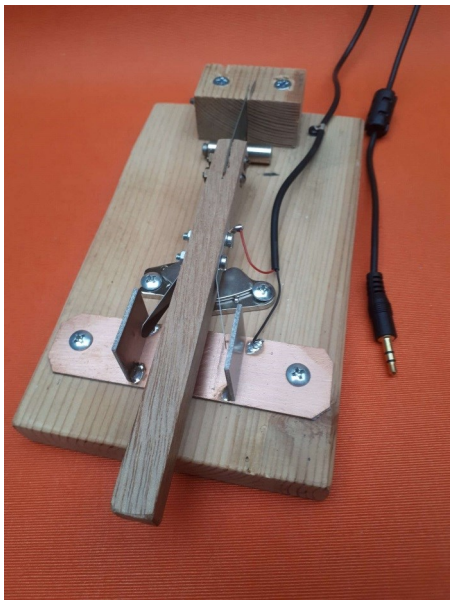
I'm a member of the **Straight Key Century Club (SKCC)**[1]. Last August, I wanted to participate in their monthly competition, the **Weekend Sprint (WES).** Every month there is a certain theme, and this time it was "Home Brew Keys". For each QSO with a homemade key you could add 5 bonus points. The key had to be made especially for this edition of the WES.

Meanwhile, since getting my **Triple Key Award** [2], my favorite key had become the sideswiper or cootie key, so I had to build a new cootie. Coincidentally, another SKCC member, **Joop PG4I**, had published a photo in the SKCC newsgroup the day before. That was this picture *[right]* the PG4I Homebrew Cootie



That seemed like a nice design to build, only I didn't have that much time, and I'm not a real metalworker. So my contraption was made with some pieces of wood I found in my garage.

I call my cootie appropriately the **ON7DQ Woody Cootie**. There was also the time pressure: on Saturday I really didn't have any time, so I only started building my cootie on Sunday morning, but 1 hour and 15 minutes later my artwork was ready!



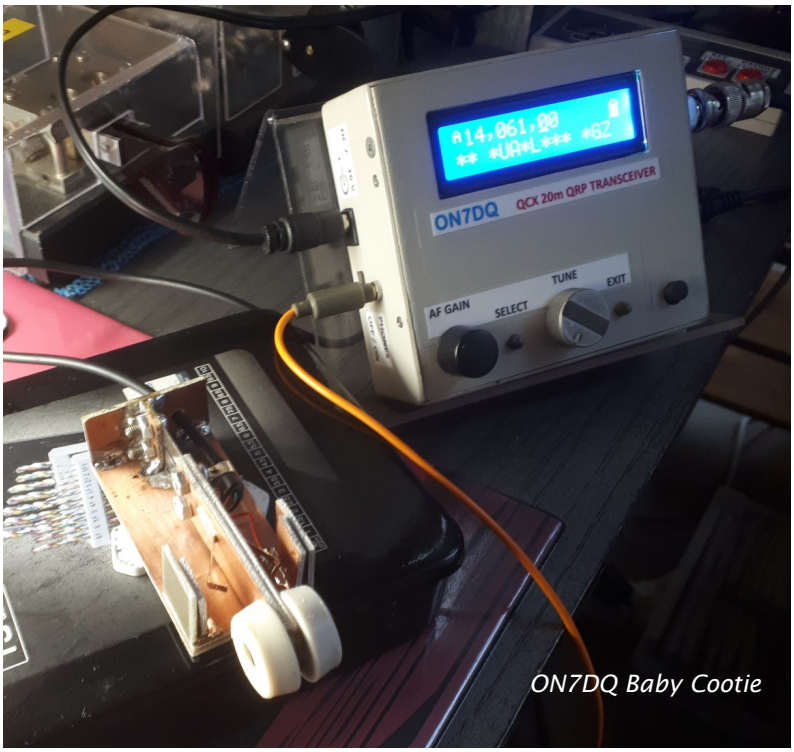
ON7DQ Woody Cootie

I took a piece of board of 10 x 17 cm, as a base. In a small wooden block I sawed a slot, in which I fitted a steel spring, I secured it with 1 long M3 bolt. This block was then placed on the base plate with two wood screws. On the spring comes the "lever", a square wooden stick of 1 x 1 cm, length 14 cm. A slot in the lever and two M3 bolts fix it to the back spring.

Then come the contacts. With a cootie it is important that you can push a little further than the point at which you make contact with the left / right movement, otherwise your rhythm is interrupted too abruptly. So on the lever came another two pieces of steel spring from the junk box, secured with another two M3 bolts. The contacts don't have to be isolated from each other as with a paddle, a cootie actually only has 1 contact.

The other side of the contact (the ground) was made with pieces of circuit board. The contact distance can be controlled by soldering the vertical pieces nearer or further away from the center. I didn't have time for adjustable contacts.

Then some damping was needed. If you release the lever in a cootie, from the contact position, you will get a whole row of dits… this is not desirable (this also happens with the many classic "hacksaw blade" cooties). The solution was quite simple. A strong magnet from a 2.5" hard disk was attached to the base, under the steel parts on the lever. The influence on the steel contact springs appears to be sufficient to slow down the lever when you release it, and to bring it nicely to the middle position (when putting the magnet in place, slide it left or right before fixing the screws, and check that the lever is nicely in the middle position). Because the spring of the lever at the back is only fixed with 1 bolt, you can raise or lower the lever a bit.



ON7DQ Baby Cootie

By putting something of the appropriate thickness under the spring, you can adjust the height of the lever above the magnet, and thus set the amount of damping. On the picture you can see that I put a round spacer (hollow tube) underneath.

If you still have too little damping, you can possibly attach something made of iron or steel on the bottom of the lever.

Finally a standard stereo cable with 3.5mm plugs was cut in half and soldered to the contact and the circuit board (only "shield" and "tip" are needed) and the cootie was ready.

Of course, a wooden key base does not stay put on the table if you start swiping left to right. So I increased the weight of my cootie with a block of lead of 2.5 kg… it was my previous cootie key, hi. But instead of putting the weight "at the base", I just put my old cootie on top of the new one... You can see this in a short demo video on my YouTube channel. *[3]*

You could of course also secure the cootie with a clamp, or stick it to the table with those 'poster stickers' (blue tack), with Velcro strips ... plenty of possibilities.

All very primitive perhaps, I'm sure it could be done much more professionally, but we are 'amateurs' after all, right?

Improvements?

I would make the contact points adjustable, and also attach two wooden 'fingerpieces', to the front of the lever.

With this cootie I did not win the WES, but I still made 17 QSOs that Sunday, good for a 113th place out of 221 participants, not bad for an improvised key… and the bonus points helped.
The Woody Cootie is still in use today, and more than 200 QSOs later!

Thinking along the same lines, I also made a small version for portable work, a “baby cootie”. Most is made of pieces of PC board and a few steel springs from the junkbox. It works quite well, and I used it in a recent QCX Challenge. The ON7DQ Baby Cootie is shown on the previous page.

The magnet is glued to the underside of the cootie this time, doubling as a way to fix the key to the top of a transceiver, or any other steel base you can find.
In the picture I used a drill box from my workshop, and it worked quite well!

73,

~ Luc ON7DQ

References

[1] https://www.skccgroup.com/

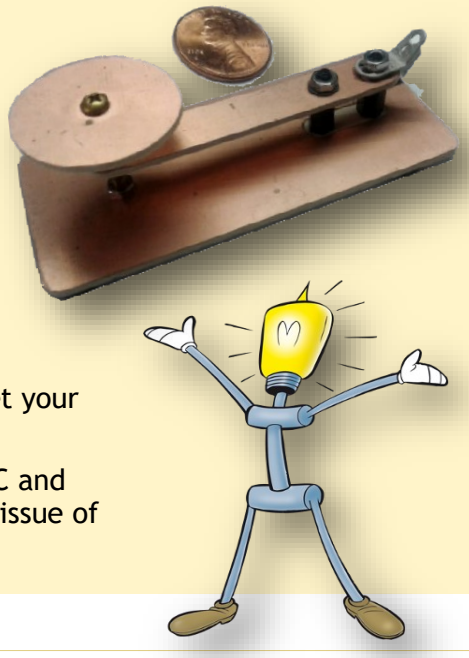
[2] https://www.skccgroup.com/operating_awards/triplekey/

[3] https://www.youtube.com/watch?v=vExG_TNNIpY

Now, show us…

‘Build a Key’ contest

OK, so now Luc has shown how you can make a key, be it ‘straight’ or a ‘sideswiper’… its your turn… Metal? Wood? 3D-printed? SARC is sponsoring a contest for home-built keys. We will award a prize to the following categories:



The most useful key

This key must be compact, accurate, comfortable to use and reasonably sturdy.

The most beautiful key

Goes without saying… this one must be a thing of beauty but must also conform to the above criteria of being accurate, comfortable to use and reasonably sturdy.

The most unique key

Aside from being accurate, comfortable to use and reasonably sturdy, let your imagination rum wild.

Because we have to judge these locally, the contest is only open to SARC and SEPAR members until May 31st. Results will be published in the summer issue of The Communicator.

...more

Ham Hardware

Al Duncan VE3RRD

Care and Feeding of Gel Cell Batteries

The name “gel cell” refers to the fact that this battery uses a gelled electrolyte rather than a liquid one. It is a type of SLA or sealed lead acid battery.

The 6V and 12V models are the two most useful for amateur radio applications. The problem most often experienced by hams is a shortened battery life due to improper charging methods and excessive discharging.

Although exact values vary from one manufacturer and battery type to another, the data printed on the battery or on the manufacturer’s spec sheet may look like the table values below.

This particular battery is a newer design which recommends higher float and cycle charge voltages than most gel cells you will find. A more typical recommended float voltage is 13.4 to 13.5VDC and a maximum charge voltage of 14.1 to 14.4 VDC, also a minimum discharged

Battery type: Sterling H7-12 12V 7Ah C20 to 1.75V/C, 25C/77F

Float charge 13.60-13.8VDC; Cycle charge 14.50-14.90VDC; 77F/25C

12V 7Ah	*12V battery rated for a maximum 7A discharge rate over 1 hour.*
C20	*indicates a charge rate of 7A/20 or 0.35A (350ma) is recommended.*
to 1.75VDC	*indicates the minimum voltage for this battery is 1.75V per cell. This would work out to (1.75x6=) 10.5V for the battery.*
25C/77F	*indicates that these values are valid for a battery temperature of 25C/77F. As the temperature increases above 25C, the float voltage must be reduced*
Float charge	*in this case, 13.6-13.8V is the voltage the battery can be indefinitely float-charged at to keep it ready for use.*
Cycle charge	*the 14.5-14.9V value is the maximum charge voltage, the battery should only be charged for a short time at this voltage.*
77F/25C	*again, this is the battery temperature that these values are valid.*

voltage of 11VDC is more likely. As the battery temperature increases above (in this case) 25C, the float and cycle voltages must be reduced slightly. Likewise, as the battery temperature decreases below 25C, these two values can be increased slightly. You will have to refer to the manufacturer's data to find the temperature/voltage curves for your battery.

What all this means for amateur radio use

The most useful setup is to have one (or more) 12V gel cell battery packs always attached to a suitable 13.5VDC power supply - float charging. The 12V pack can be either two 6V batteries connected in series, or a single 12V unit. The 13.5VDC float voltage will keep the batteries ready for use, and they could be left attached like this for years without overcharging them. Most 13.8V power supplies have a voltage set control on the circuit board which can be used to reduce the voltage to 13.4 to 13.5VDC.

Note that if the gel cells you are using specifically state that you can use a higher float voltage such as 13.8V, then you can substitute this voltage where ever I mention 13.5V. I found an inexpensive 3A power supply in a metal case, probably made to power a CB radio, which had an internal voltage adjustment. It is recommended to use a digital volt meter for measuring and setting these voltages, an analog meter can have an error of half a volt or more. If your batteries can use a 13.8V float charge, then you can use the option of connecting it (through a current limiting resistor) to your existing 13.8V ham station supply. Just make sure that the power supply circuit doesn't discharge the battery when it is turned off. Never consider using any type of automotive/motorcycle/ski-do charger on a gel cell – this is instant death for the battery.

Some motorcycle batteries may look like a gel cell, but are a different type of sealed lead acid battery.

Problems can arise when one (or more) battery packs have been used and are in various states of discharge. Due to the recommended charge current of 350ma (some batteries can handle up to 500ma), a resistor must be installed in each battery's wiring harness to limit the maximum current to that battery. This resistor can be about 1 ohm, you may need to measure the charge current with a current meter. This method of connecting the discharged gel cell to 13.5V will generally work to return the batteries to near full charge and place them in a float charging state.

To bring a previously discharged battery up to full charge requires that you connect it to an approximately 13.8VDC power supply (through the current limiting resistor) for a period of time. You will have to monitor the battery terminal voltage to see when it reaches 13.8VDC and then immediately remove the battery from 13.8V and return it to the 13.5V float voltage (unless the float voltage for your battery is 13.8V).

To further complicate things, after many discharge/charge cycles, the different cells in the battery pack will begin to discharge/charge differently. To "equalize" the cells in the battery, it is temporarily connected to 14.1 to 14.4VDC for a short time (until the battery terminal voltage comes up to this value) and then connected to the 13.5V float supply. Some newer batteries such as the Sterling model, state that they can be float-charged at up to 13.8V, and that the equalize voltage can be 14.5 to 14.9V. The general rule is to equalize the battery for no more than 0.5 hours per ampere hour of battery capacity – but never more than 4.5 hours. For a 7 Ahr battery this would work out to a maximum equalize time of 3.5 hours.

If a gel cell battery is not kept connected to a float charger, then it must be charged up at approximately one month intervals. A new battery will come fully charged from the manufacturer, but internal leakage will discharge a fully charged gel cell battery in a matter of a few months which can permanently damage it. Do not leave a gel cell for any length of time in a discharged state (this can really shorten its life), recharge as soon as possible. If

you are buying used Gel Cell batteries at a flea market for example, be sure to have your digital voltmeter with you (and a load such as a small automotive 12V light bulb). After a gel cell battery has been removed from the charger, the terminal voltage will gradually decrease to a nominal 12.6VDC. If you only buy used batteries equal to or higher than 12.6V, then you know it has recently been charged and is probably OK. If the terminal voltage is at or below 10V for a 12V battery or 5V for a 6V battery, then it is not worth buying. When you apply a load (use something that draws ½ amp or less – the 561 bulb draws about 1 amp), the voltage should sag very little.

Currently the setup I use can charge/float charge at least 4 battery packs (each made up of two 6V batteries taped together and connected in series). I have my power supply set at about 13.6V output, and each battery is charged through a current limiting "resistor". This "resistor" limits the current to around 350ma to a discharged battery.

The advantage of this configuration is that I can attach fully discharged and fully charged batteries at the same time. The addition of diodes in series with each resistor (set the supply float voltage 0.7V higher) would prevent the charged packs from trying to charge the discharged ones – this could occur if the power supply AC was turned off (power failure). Rather than find 1 ohm resistors, I use type 561 automotive 12V light bulbs from Canadian Tire (part number 20-2651) which have a cold DC resistance of about 1 ohm and appear to limit the maximum charging current to an optimum 300 to 400 ma. The added advantage is short circuit protection – if the wires which are attached to the battery are accidentally shorted together, all that happens is that the light comes on. If you wish to add diodes, type 1N4001 will work well.

Once the terminal voltage on the recharging battery has reached 13.6V, I can use a (500ma or less) "wall-wart" DC supply that I have added several diodes in series and a resistor to reduce the no-load output voltage to about 14.4V; to equalize my battery if I wish. I connect a volt meter where I can keep an eye on it and disconnect the battery when it reaches 14.4 VDC, I then reconnect it to the 13.6V supply; where it remains connected until I next use it.

Note that a gel cell battery is not designed for high current applications (use a liquid SLA battery for this). A fuse should be installed to prevent high current discharge, for example a 10 amp or smaller fuse for a 7Ahr battery pack. If you are using two 6V batteries, the fuse holder can be used to connect them in series.

In an emergency (or if no other means is available), recharging a gel cell can also be done from an automobile lighter outlet (through a current limiting resistor). Typically the car voltage will be between 13.8 and 14.5VDC with the engine running – just don't leave it connected too long (check the gel cell terminal voltage). Again you can add a diode in series if you find that the alternator voltage is a little high (maybe even a switch to bypass the diode if equalization is required). Also, don't leave the gel cell plugged into the lighter outlet when the engine is off or when you are starting the engine. There is one advantage to adding a diode, the gel cell can't discharge into the car electrical system, and it will only charge when the car voltage is above 14.2V which would allow you to keep it plugged in all the time.

In the first two charger designs given below, there is still a requirement to limit charge current. If the gel cell has been fully discharged (10.5 to 11 VDC), it may attempt to recharge at too high a current level when connected to the 13.5 VDC supply, so a current limiting resistor/light bulb at the power supply output may be required.

In the first circuit *[next page]* which uses a LM7812 with two diodes to raise the output from a regulated 12.0V up to approximately 13.4V; a third diode could be added in series to raise the output another 0.7V. This would

allow you to have more than one battery pack connected, each through its own diode and resistor.

In the second circuit, resistor R2 could be replaced by a 1K variable resistor to allow the output to be adjustable to a higher voltage.

The third circuit is an advanced design using the MAX712 battery charging IC.

This will charge gel cells and maintain a float charge of 13.4 volts. The bridge rectifier will accept an input of either AC or DC from the wall wart. With the rectifier bridge on the input you don't have to worry about the output polarity of the wall wart.

The diodes raise the ground terminal of the 7812 about 1.4 volts above ground. Each diode has a .7 volt drop. Therefore 12 + .7 + .7 = 13.4 volts.

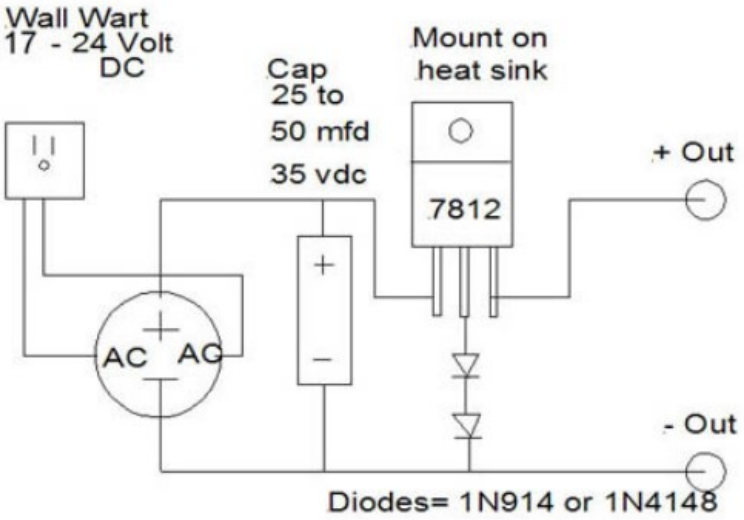
Gel cells should normally be charged at 1/10 to 1/20 their rated output.

One added component - a diode (such as a 1N4001 or 1N4002) – is needed to protect the 7812 regulator from damage when the input voltage is disconnected while the battery is being charged. Connect it between the input and output pins of the 7812 (stripe facing the input pin).

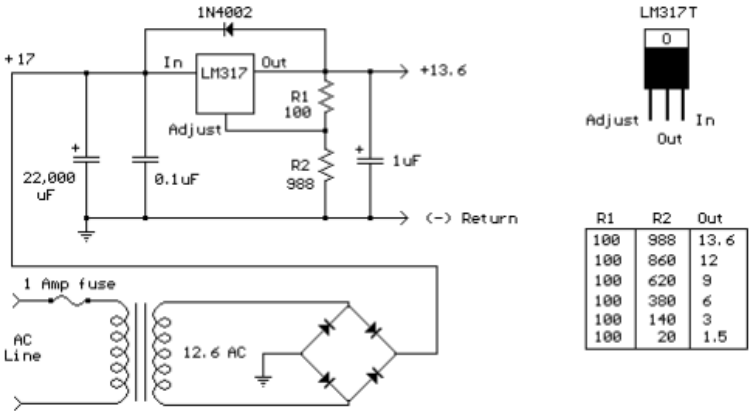
Normally the input voltage is at least 3 volts higher than the output, if the output is higher than the input, the diode will shunt the current around the 7812. This scheme is used in the second charger circuit on the next page.

The data sheet for the LM7812 can be found at [LM78XX, LM78XXA - 3-Terminal 1 A Positive Voltage Regulator (mouser.com)]

~ AL VE3RRD



Schematic for 12 v Gel Cell charger, by KB2OTY



LM317T Variable Voltage Regulator
Data sheet: [Datasheet - LM217, LM317 - 1.2 V to 37 V adjustable voltage regulators]

...more

12V Gel Cell Charger by N1HFX

Recently, a fellow amateur was looking for a gel cell charger which would first charge at a fixed rate and then later switch to a trickle charge when the cell was fully charged. After reviewing several catalogs and web sites, the MAX712 IC was discovered. This IC meets all the requirements for almost any type of battery charging system. The circuit in Figure 1 was designed specifically for 12 volt gel cells.

When a discharged gel cell is connected, the charger goes into a fast charge mode at a fixed rate of 400 ma. After the chip detects the voltage leveling off or when 4 1/2 hours has elapsed. (which ever happens first.) the fast charge will stop. After the fast charge has ended, the IC goes into a trickle charge rate of about 50 ma. This trickle charge continues until 13.8 volts is reached which will stop all charging current since the cell is now fully charged. If the cell voltage should drop for any reason, either a fast charge or trickle charge (IC will detect what is needed) will start again.

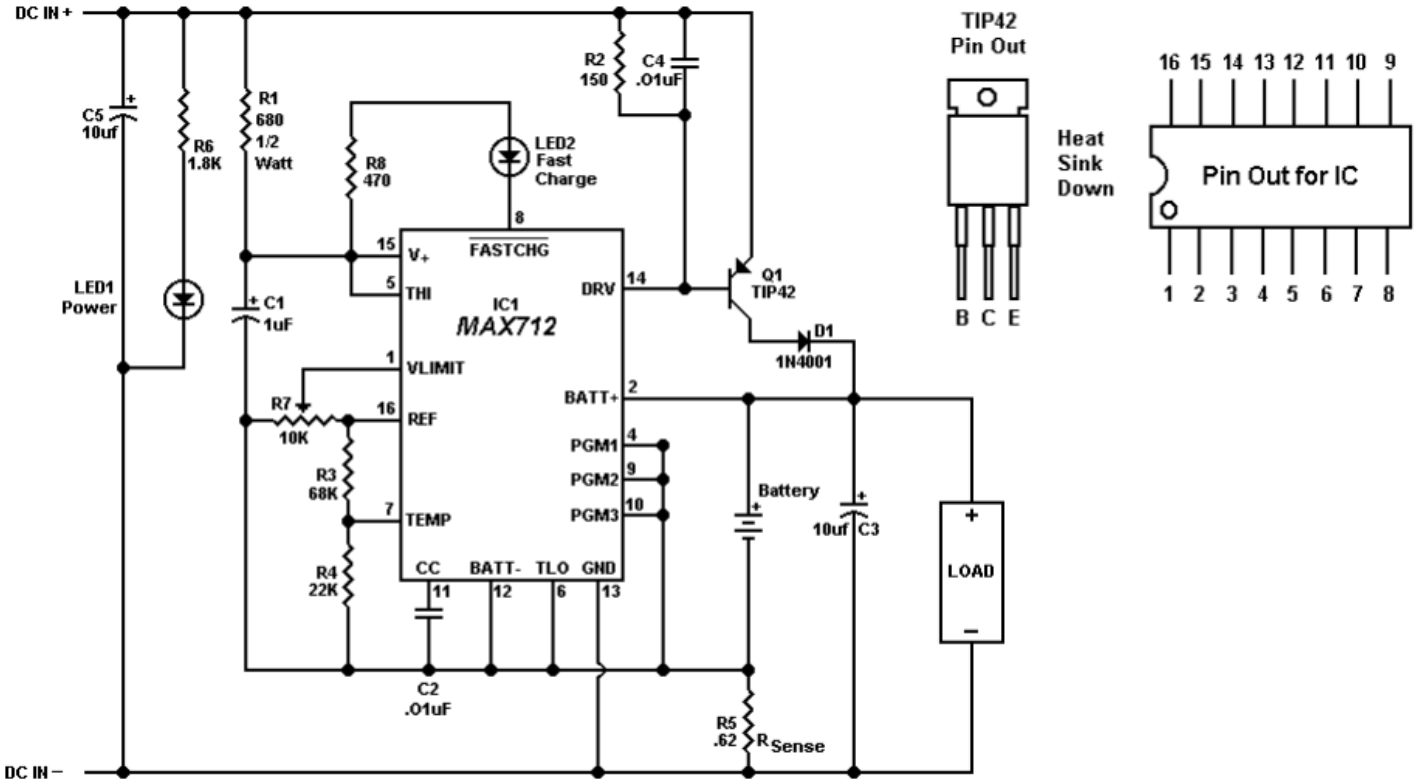
When constructing this circuit, be sure to attach a small heat sink to Q1. Apply a DC (partially filtered) voltage of **at least 15.3 volts**. The voltage must never go below this level even under load conditions. Many of the DC wall transformers available will work just fine as long as they meet the minimum voltage requirement. The input voltage can be as high as 24 volts. If the input voltage must be in the 30 volt range, increase R1 to about 820 ohms.

The output voltage must be aligned prior to use. Disconnect the battery from the circuit and apply power. Connect a digital volt meter or other accurate volt meter to pin 2 (positive lead) and to pin 12 (negative lead). Adjust R7 until exactly 13.8 volts is read.

Because this circuit will not overcharge a gel cell, the battery can be connected indefinitely. This circuit is designed primarily as a 12 backup system and can be connected to the load provided the device to be powered only draws current during power line interruptions. Use a diode from the battery to load if needed. This circuit makes an excellent battery backup to an amateur transceiver.

The MAX712 IC and the .62 ohm resistor are available from Digi-Key, 701 Brooks Ave, Thief River Falls, MN 56701 (1-800-344-4539). Order part numbers MAX712CPE-ND and 0.62W-1-ND respectively. .

~ N1HFX



Parts List

IC1	MAX712 Battery Fast-Charge Control IC
R1	680 ohm 1/2 watt resistor (Blue Gray Brown)
R2	150 ohm resistor (Brown Green Brown)
R3	68K resistor (Blue Gray Orange)
R4	22K resistor (Red Red Orange)
R5	.62 ohm 1 watt resistor (Blue Red Silver)
R6	1.8K resistor (Brown Gray Red)
R7	10K PCB trimmer resistor (103)
R8	470 ohm resistor (Yellow Violet Brown)
C1	1 microfarad tantalum capacitor (observe polarity)
C2, C4	.01 microfarad capacitor (103)
C3, C5	10 microfarad electrolytic capacitor
Q1	TIP42 PNP transistor or similar (attach heat sink)
D1	1N4001 Diode (observe polarity)
LED1 LED2	2 volt standard LED (observe polarity)

Where is the RF Digital Multimeter?

Bob maintains a great blog site at https://www.k0nr.com/wordpress/.

Contact Bob at bob@k0nr.com.

You can also check out his book VHF, Summits and More: Having Fun With Ham Radio.

One of the most useful electronic test tools available to us is the digital multimeter (DMM). There are many different models to choose from but for less than $50, you can get a decent quality meter that measures DC and low-frequency AC voltage, current, and resistance. Using such a meter, with auto-range capability, is pretty much a matter of selecting the desired measurement function and connecting up the test leads. It is a really simple, but effective measurement device.

So where is the radio frequency (RF) equivalent of the DMM? There are some excellent multifunction RF/microwave instruments such as the Keysight FieldFox analyzer. But these professional instruments are much more expensive than a DMM and much more complicated. I am thinking of something that has the same Select-and-Connect usability of a DMM.

Low-Cost RF Instruments

In recent years, low-cost RF instruments have emerged that can make some impressive measurements. The first one that comes to mind is the nanoVNA, a compact vector network analyzer. There are several different models available but a typical configuration covers two-port measurements from 10 kHz to 1.5 GHz, at a price of around $70. The nanoVNA is quite capable, able to measure two-port s-parameters (reflection and transmission), return loss, standing wave ratio (SWR), etc.

More recently introduced, the tinySA spectrum analyzer *[top next page]* offers basic spectrum analyzer measurements from 0.1MHz to 960 MHz. The cost is ~$60 and the SA includes a basic signal generator feature.

A DMM

I own both of these devices and I think they are excellent instruments for the price. But they aren't what I am looking for in an RF DMM. They do provide a proof point that simple and affordable RF instruments are possible.

Another device that has caught my attention is the Surecom SW-33 SWR / Power meter *[right]*. This tiny meter is great for tossing into my SOTA backpack or radio Go Kit, to have some basic RF measuring capability in the field. It covers 125-525 MHz, up to 100 watts (with an appropriate dummy load or antenna), for less than $50.

But it only measures SWR and power. Not bad but not quite everything I'd like in my RF DMM.

Antenna analyzers are another category of affordable RF test equipment. As the name implies, they are focused on making measurements on antenna systems. Again, there are many different models to choose from, ranging in price from about $100 to $500. Shown *[below right]* is the RigExpert Stick 230-K with a bit of a simple DMM look to it. The primary antenna measurement is SWR, but the antenna analyzers often include complex impedance, return loss, reflection coefficient, etc.

The RF DMM

OK, Bob, what is it that you do want in an RF DMM? Good question. Thank you for asking.

The device I have in mind should cover the common RF measurements that a typical radio amateur needs to perform. In terms of the use model, consider what is needed to check out a new radio installation, from the transceiver to the antenna. I want to be able to check the transmit power, the impedance looking into the coaxial cable, the SWR (and return loss) of the antenna system across the typical ham bands (160m through 70 cm).

the tinySA spectrum analyzer offers basic spectrum analyzer measurements

So here is the wish list:

- Frequency Range: 1 to 450 MHz
- RF power meter (directional, inline measurement)
- RF power meter (with internal dummy load)
- Antenna measurements (SWR, Return Loss, complex impedance, other derived values)
- Frequency counter
- Basic signal generator (produce a sine wave at a particular frequency)
- Probably an N connector for ruggedness and good match at UHF frequencies. However, an SMA connector would have the advantage of small size and might be more appropriate.
- Price: <$50

Surecom SW-33 SWR / Power meter

RigExpert Stick 230-K

I initially left out the signal generator but the antenna measurements will generate a test signal, so having a simple signal generator is not

This book is an easy-to-understand introduction to VHF/UHF ham radio, including practical tips for getting on the air and having fun messing around with radios. Learn about FM, SSB, repeaters, equipment, band plans, phonetics, portable operating, Summits On The Air (SOTA) activations and more.

a big stretch and can be very handy. A couple of bonus features could be the measurement of FM deviation and decoding of CTCSS frequencies. I think these can be added at minimal cost but they are a nice to have feature, not mandatory.

I included an internal dummy load for simple RF power measurements. It is really handy to be able to check power level independent of the antenna system. This raises the issue of what power level it will support and for how long. It would be great to be able to measure 100-watt transmitters for a short period of time but that may be inconsistent with a low-cost, handheld device. A 5-watt dummy load should be easy and maybe a bit more…perhaps 25 watts? Of course, external attenuators can be used for measuring higher power.

It will be tempting to include frequency sweeps of the various parameters but simplicity should be the top priority, so the RF DMM probably only measures one frequency at a time. Leave out the fancy display, analogous to how a typical DMM does not provide an oscilloscope display.

It is also tempting to include standard DMM features in this device, so you'd have one meter that covers all of the basic ham measurements. Given the availability of inexpensive DMM integrated circuits, this would not be a big stretch. This would require separate DMM inputs (banana jacks). Perhaps skip the current measurement capability and just have DC/AC voltage and resistance? But everyone already has a normal DMM, so I see these features as optional.

The price point may be aggressive but the idea is to make it cheap enough that most radio amateurs own one, or several. Keep one in your Go Kit, one at home, and one in the car (similar to a DMM).

So that is my idea for an RF DMM. What do you think?

~ Bob KØNR

Gil

How's That North America Adventure Frequency Working?

In January 2021, I wrote about the North America Adventure Frequency (NAAF) which originated in the North America SOTA community. About a year later, how is this working out? Is anyone actually using it?

A few key points to remember:

- The NAAF is 146.58 MHz.
- This frequency is in addition to, not a replacement for, the National Simplex Calling Frequency 146.52 MHz.
- Local usage will likely vary depending on needs.
- Program 146.58 MHz as The Other Simplex Frequency in your radio.

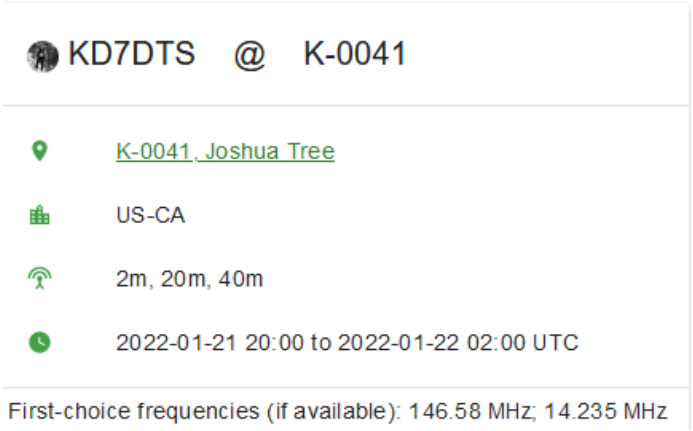
I've noticed that quite a few SOTA activators are posting Alerts and Spots with 146.58 MHz. For example, K2CZH and KN6OUU posted the SOTA Alerts shown in the first table below.

Here N8FN and WJ7WJ are spotted on 146.58, shown in the table at the bottom of the page.

Of course, the National 2m FM Calling Frequency (146.52 MHz) still gets a lot of use. I tend to use Five Two when I am activating in rural areas, some distance from the major cities. The frequency is usually quiet AND there are a number of folks that tend to monitor it. I use the NAAF when I'm near the big cities (Denver, Colorado Springs, Boulder, …). Putting out a Spot is usually important, to get the attention of the more dedicated SOTA chasers watching SOTA watch. That is, I don't think there are a lot of people monitoring the frequency

Date/Time	Callsign	Summit code	Summit name	Altitude	Points	Act.	Frequencies/Comments
Fri 16:30z	K2CZH	W3/SV-018	Broad Mtn	2388 ft	6	20	40M-SSB, 146.58-FM Cancel this one roads are solid ice (K2CZH)
Fri 19:00z	KN6OUU	W6/CT-019	San Gabriel Peak	6161 ft	6	142	146.58 FM, 14.345 SSB (kn6ouu)

Time	Callsign	Frequency	Mode	Summit code	Summit name	Altitude	Points
19:13z Fri	N8FN	146.580	FM	W6/CT-243	Mount Rubidoux	1398 ft	1
18:52z Fri	N8FN	146.580	FM	W6/CT-243	Mount Rubidoux	1398 ft	1
17:16z Fri	WJ7WJ	146.580	FM	W7O/NC-097	2360	2359 ft	1



(compared to 146.52), so a spot on SOTAwatch gets them on frequency.

Some of the Parks On The Air (POTA) activators are also using NAAF. Here's an activation alert by KD7DTS from the POTA website:

So I think the NAAF is working as intended. It is not a replacement for 146.52 MHz but a standard choice for portable operating when you want to stay off the calling frequency. Thanks to everyone that has given it a try.

What is your experience?

73 Bob K0NR

Emergency Comms

Amateur Radio Making A Difference

Pandemic project: Trailer renovation allows

Frank Hutchison's pandemic project started with a question: how could he better help communities during emergencies like natural disasters?

"I'm an Assistant Emergency Coordinator for the Spokane County Amateur Radio Emergency Service (ARES)/Auxiliary Communication System (ACS)," he said. "In this role, I needed to be able to deploy to any location and provide emergency communications including for extended periods of time."

For example, two years ago during the wildfires in Oregon, a call went out for radio operators. Without a place to sleep, eat, or operate his UHF/VHF (ultra-high frequency/very high frequency), and HF (high frequency, formerly known as short-wave) radios, he felt he'd be more of a burden than a help.

At 71, the retired Navy commander and former Boy Scout leader said it became obvious that tent-camping and sleeping rough was no longer wise. He decided to look for a trailer to build out to his specific needs.

Hutchison's son, Richard, had introduced him to the world of amateur radio three years ago.

"My son said he was coming to Spokane for the annual Hamfest event and he was going to pay for me to take the amateur radio license test," explained Hutchison.

He passed it and went on to take and pass two additional tests. However, he still didn't own a radio.

"Richard fixed that," he said. "As soon as I passed the tests he gave me one."

But the hobby quickly proved addictive.

Hutchison grinned.

"I now have 14 radios."

Not content to be a hobbyist, he quickly became involved in the Amateur Radio Relay League, the Amateur Radio Emergency Service (through Spokane County Department of Emergency Management), as well as the Church of Jesus Christ of Latter-day Saints communication system. All told, he's completed 220 hours of training in the past three years.

"I have a terrible habit of every time I get involved in something, I end up in leadership," he said.

After months of searching for a suitable trailer finally in October 2020, his daughter found one on Facebook.

"It's a 1961 151/2-foot Santa Fe camper trailer that had been gutted by a previous owner," he said. "A blank slate for me."

He'd written a list of specifications and using that, he began to work on it in February. His naval experience came in handy.

"One of the last courses I took in the Navy was submarine design," Hutchison said.

He gestured to the trailer parked at his Spokane Valley home.

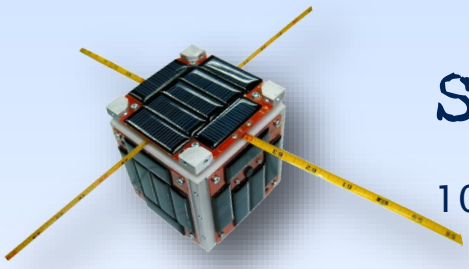
"I used a lot of that knowledge in this."

The first thing he created was a built-in communication center for three radios. He tucked them neatly under a cabinet holding supplies and installed a slide-out desktop. Two heavy-duty rechargeable batteries, each capable of 100 amp-hours are stored in a cupboard above a file drawer. Two 200-watt solar panels on the roof power the lights inside the trailer. When electric power is available, handy USB ports can charge phones and computers.

Read the full Spokesman-Review article by Cindy Hval at:

https://www.spokesman.com/stories/2021/dec/30/pandemic-project-trailer-renovation-allows-for-ext/

~ Spokesman – Review
Spokane, WA



Satellite News

10-year-old Radio Ham

Launches his 3rd high-altitude APRS balloon

10-year-old radio amateur Max W0MXX has been building Amateur Radio APRS transmitter payloads to act as tracking beacons and launching them into the stratosphere. Max is a member of the Medway Balloon Society and has recently launched his third balloon flight WB-3.

In early June, Max launched "WB-2" which only captured about 30 seconds of video footage when the on-board data storage space ran out, due to a hidden trash folder full of test files. WB-2 also required the help of a tree climber to retrieve the payload (where all the electronics and software are located).

Max then successfully launched, tracked, and recovered (using Ham Radio technology) WB-2.5 which Max called an "epic moment." That payload had a great deal of footage with one small problem which they resolved in the field.

"Now it didn't go perfectly due to some kind of automatic white balancing the footage ended up tinted completely red so we had to color correct it," said Max, who will enter fifth grade in the fall. WB-3 had more weather sensors and flew with some science experiments.

Watch WB3 - I launched Earth into the stratosphere... for science!

https://www.youtube.com/watch?v=pDGSaZW2EUQ

Read the Medway and Millis story from August 2021:

https://www.millismedwaynews.com/2021/08/02/364393/rising-fifth-grader-launches-second-weather-balloon-max-kendall-is-now-working-on-a-third-with-the-medway-balloon-society

~ Southgate Amateur Radio News

How to work the HO-113 / CAMSAT XW-3 satellite

Watch John Brier KG4AKV work new linear satellite HO-113 / XW-3 and talk about some of its issues so you can learn how to work it successfully despite those issues.

On December 25th, while most of the space community was excitedly discussing the James Webb Space Telescope (JWST) launch of that morning, the amateur radio satellite community was also anticipating their own new satellite launching that evening. On December 26th at 03:11 UTC, XW-3 (CAS-9), was launched on a CZ-4C launch vehicle from the Taiyuan Satellite Launch Center in China, piggybacked with the ZY-1(02E) earth observation satellite.

XW-3 was designated HO-113 by AMSAT a few days after launch.

Transponder passband frequency table for printing

https://www.dropbox.com/s/0tsrxs2l2lzr1ix/HO-113_frequency_table.pdf?dl=0

XW-3 user manual

https://www.amsat.org/wordpress/wp-content/uploads/2022/01/XW-3_Manual_1.11.pdf

Update: The passband center frequency may actually be higher than what is published in the XW-3 user manual and what is shown at 4:19 in this video.

https://mailman.amsat.org/hyperkitty/list/amsat-bb@amsat.org/thread/736P6BJPXJXEMDUJI77KLJ6HTGRGKOMF/

This video was based on this article:

https://spacecomms.wordpress.com/2022/01/02/new-chinese-linear-satellite-xw-3-and-its-issues/

Video

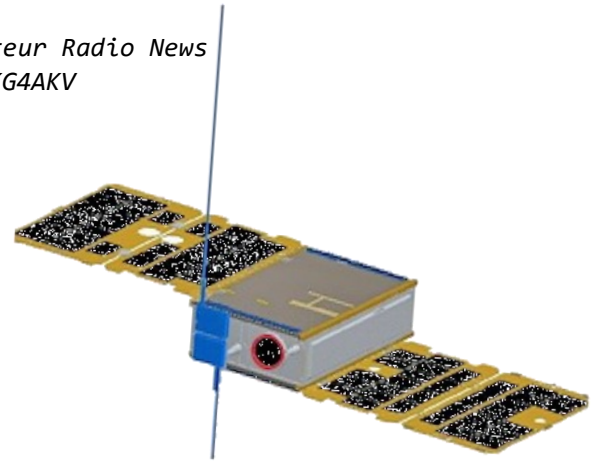
- 00:00 My setup
- 00:48 Demonstration
- 03:44 Background on HO-113
- 04:41 weak downlink, high SWR?
- 06:03 Real reasons for weak downlink
- 06:48 Deaf receiver
- 07:28 Noisy passband

Watch New linear satellite HO-113 and its issues

You can subscribe to SpaceComms at

http://bit.ly/YouTubeSComms

~ Southgate Amateur Radio News & John Brier KG4AKV



Solder Splatter

Galway Radio Club

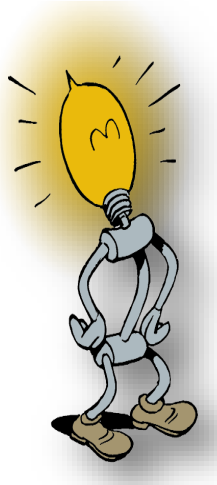
A PC Headset For the Shack

A Heil-Pro headset is an attractive idea for the shack but is it really worth the price? Ok there are many plus points like tailored Audio and no distraction from external noise but they are bulky!

There are many PC gaming headsets which are far more comfortable to wear and also have excellent sound reproduction. These are perfectly adequate for purpose and won't break the bank. K8JHR lists a number of headsets that would be suitable at this link:

http://www.k8jhr.com/files/headset_notes_and_reecommendations.pdf

I generally use the PC Headset with the jack-plugs as these are cheaper. Amazon and eBay are good sources for these. A Plantronics headset with boom mic would be my first choice although there are many other brands out there. The basic circuit for wiring to the headset mic is shown in Fig.1 below.



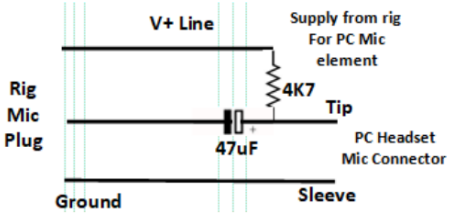


Fig. 1 PC Headset Mic wiring

The phones socket can be plugged directly into the Radio and the PTT can be brought from the Mic plug to a jack plug for either a footswitch or a small handheld switch. Obviously the footswitch is the better choice.

Trawling through the internet I found an excellent circuit by OZ1JTE Fig. 2 *[schematic next page]*. This circuit ticked all the boxes and can be used with almost any PC or Gaming Headset. The addition of the pre-amp circuit for the electret mic makes it even more versatile. The power from the 5 Volt phantom supply for the microphone is sufficient to power the pre-amp circuit. Several different headsets have been tried with this circuit and good reports have always been returned. The PTT is simply a connection from the PTT pinout on the mic plug connected to via a switch to ground. This can be either a footswitch or a push button mounted on something easy to hold.

The circuit could well be used for a small electret microphone on a gooseneck mounted on the sun visor of the car. The gain of the microphone can be adjusted to give a happy balance between voice and ambient noise from the car. It is generally not necessary to use a headset in a car as the speaker will suffice.

G8JNJ, has two circuits on his webpage. One is for the Yaesu FT- 857 and the other for the ICOM 7000 radio. They both use standard Yaesu or ICOM connections and would be easily adaptable to other radio provided you have the pinouts.

See:
h:ttps://g8jnj.webs.com/Boom%20headset.pdf

A wealth of information covering microphone connections may be obtained from the G4WPW

Microphone Connections page found at this url:

http://hendricksares.org/docs/misc/Microphone_Connections_Reference.pdf

MyDEL, Safe Speak, and Watson supply a system to fix onto the dashboard or sun visor allowing handsfree mobile operation and these all use a similar circuit to isolate the mic circuit from the phantom 5V line powering the electret microphone.

Finally, whilst it is illegal to use mobile phones in the car, the use of two way radio is not although, can be a grey area. The use of a handsfree device will naturally be more acceptable than holding a mic.

~ Galway Radio Club

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www.galwayradio.com

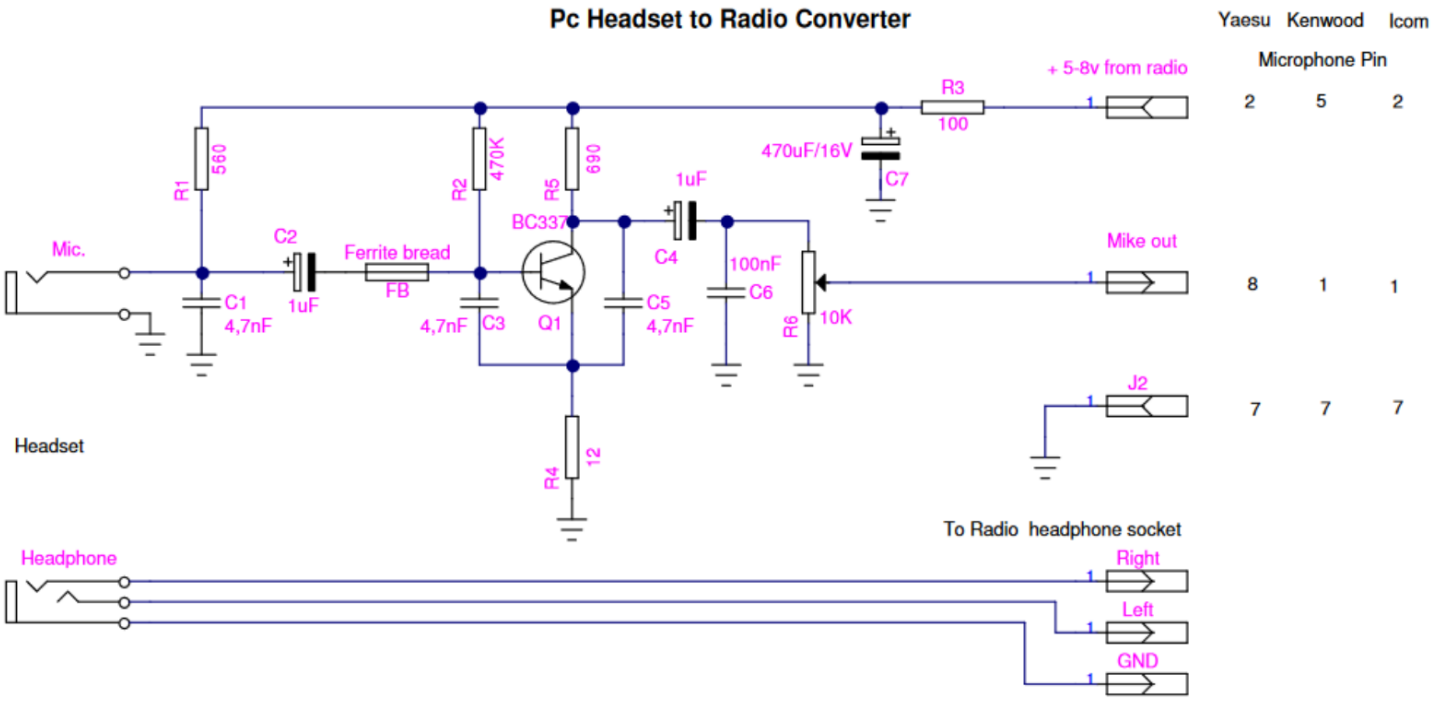


Fig. 2 ON1JTE PC Headset to Radio converter with built in pre-amp

In The Shack

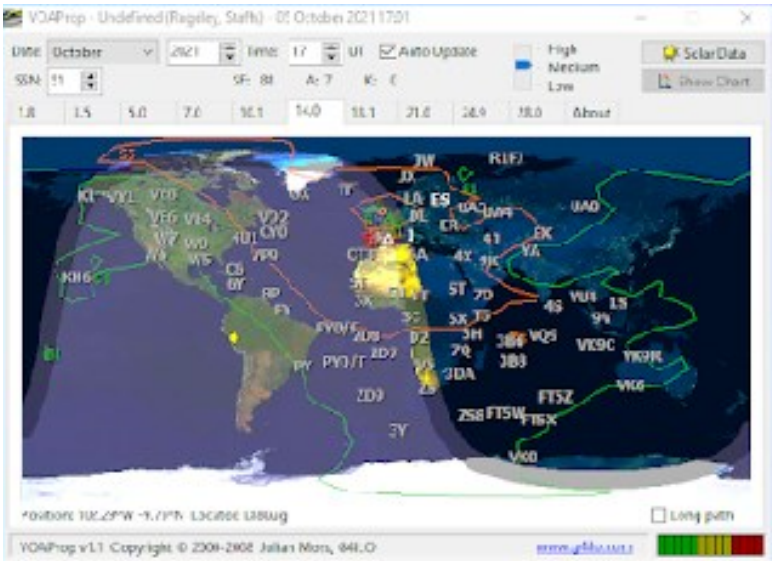
Steve G1KQH

configuring VOAPROP

Sunspots are getting higher!

Band conditions are improving once again, it's time to get active! It is nice to be able to crunch all the data and get a daily understandable, updated plot, and find out what bands may be workable, where and when, under this improving cycle.

VOAPROP is a graphical propagation presentation program, written many years ago by the late G4ILO, used in conjunction with VOACAP as its engine. It is something I have used for years, until I encountered a PC crash recently that took out my motherboard, and which I had to scrap off the entire computer and set up a newer PC with a copy of Windows 10.



However the new installation of VOAPROP didn't go smooth, and it made me scratch my head over a few long nights.

The first problem encountered, the software was not updating the Solar data? I know G4ILO had done some work on this around 2014 when WWV changed the solar file format. This is logged in G4ILO's last notes about the update.

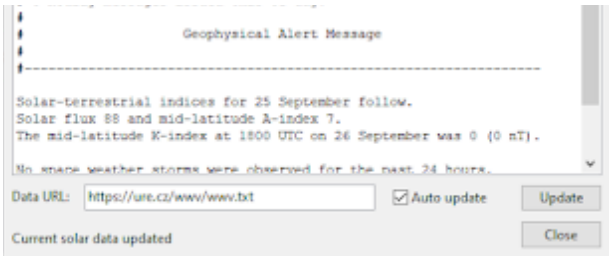
(Because of a change in the format of the WWV solar information file updates now fail with an error. Thanks to Mirek, OK1DUB a fixed version of the file has been made available. The URL in the Solar Data window must be http://ok1dub.cz/wwv/wwv.txt)

OK1DUB runs the server that takes the newer file format, and then converts it to the old format VOAPROP can use

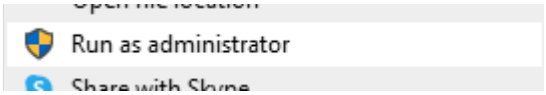
However the above link which the software comes packaged with now proves dead!

But the server still continues to work, and it's new link which URL I eventually found, must be pasted into the program Solar Data window is: https://ure.cz/wwv/wwv.txt

Second problem encountered with Windows 10. When I pasted the new URL into the software, still produced an error and was not updating the *voaprop.config* file? Again another few hours of late night head banging and scratching, Grrr! Eventually, I found the reason why?

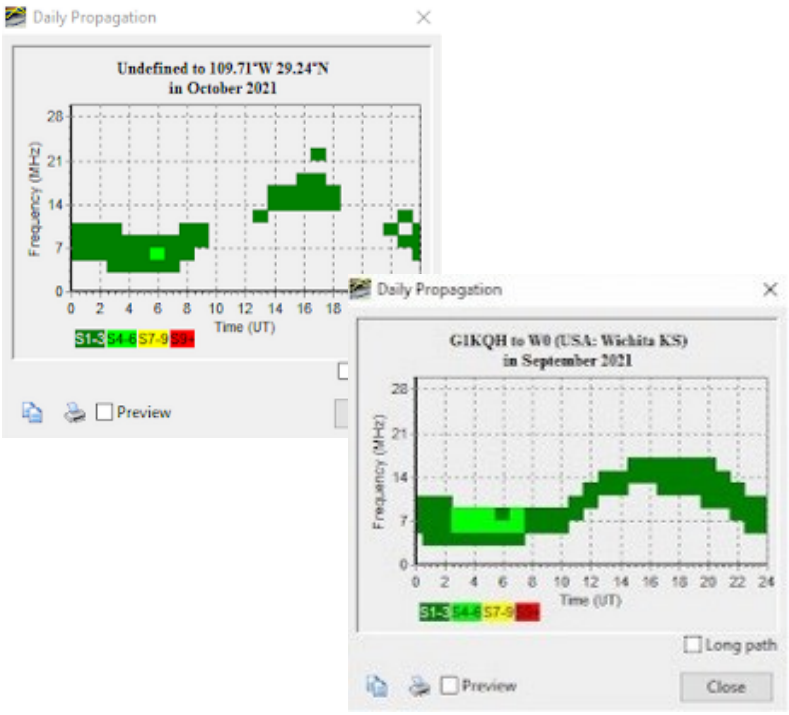


This is down to a configuration setting against the program itself, and Windows 10. What you must do, is right click on the VOAPROP icon on the Windows desktop, and click Run as administrator then add the URL again to the Solar data window, and this time it will update the file, and everything will then start to work, and you will see the Solar data update.



If you also pop down to Mirak's site http://ok1dub.cz/wwv/ you will also be able to find updated ssndata.txt and beacons.txt files which you can download and update in the root of the program.

Once you have all this updated, the program will perform flawless without any problem.



My thanks must be to the late G4ILO for writing such a superb piece of software, and his family that still keep his website open https://www.g4ilo.com/

~ G1KQH
Steve G1KQH's Amateur Radio Blog "The Font of all Knowledge"

Follow-up Note:

If you install VOAPROP to a different directory, i.e. C:\AmateurRadio\VOAPROP or even to C:\VOAPROP just like you have to do with VOACAP anyway, and this is really the best practice for installing all Radio Amateur Programs old and new alike, then you do not need to run VOAPROP as an administrator even when you want to change configuration because the user in Windows 7,8 and Windows 10 can actually write in any directory he/she creates in C:\ drive, but he/she does not have permission to write in the Program files directories as of Windoze 7 (if I remember correctly) and above! This way even old programs written for Windows XP can run happily up to Windows 10.

~ Demetre M0SUY/SV1UY

Ham on the Computer

Brendan Lowry

How to use your laptop as a second monitor

As long as your PC and laptop support Miracast, you can use your laptop as an external display.

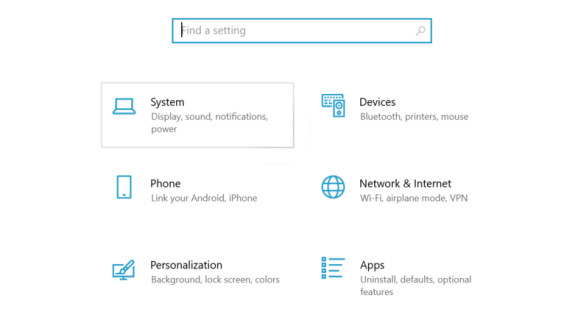
Adding a second monitor to your workstation is an excellent way to expand your productivity, and while the best computer monitors are great for this, you can use your laptop as a second display, too. This is pretty useful, as you can save some money by using a laptop that you already own instead of buying a brand-new external monitor to use. You'll be able to do this as long as both your main PC and your laptop support wireless Miracast connectivity.

In this Windows 10 guide, we'll show you how you can successfully use your laptop as a second monitor.

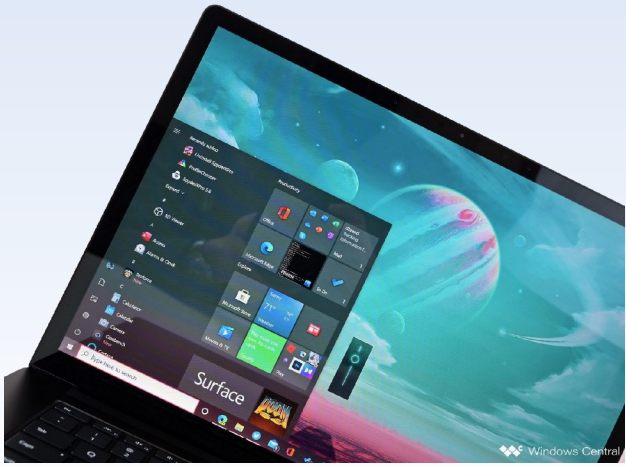
How to use your laptop as a second monitor

Here's how you can extend your desktop's display to your laptop and use it as a second monitor (this process also works with two laptops):

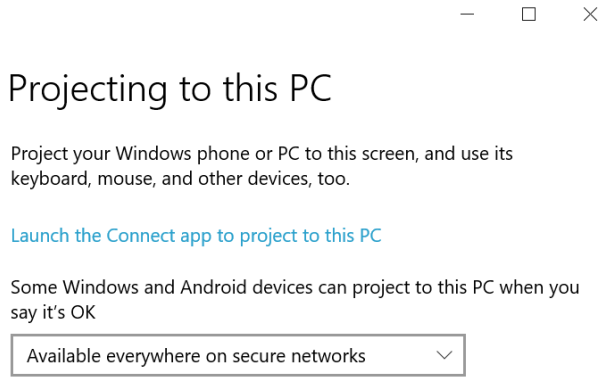
1. On the laptop you want to use as a second monitor, open the Settings app.
2. Select the System option.



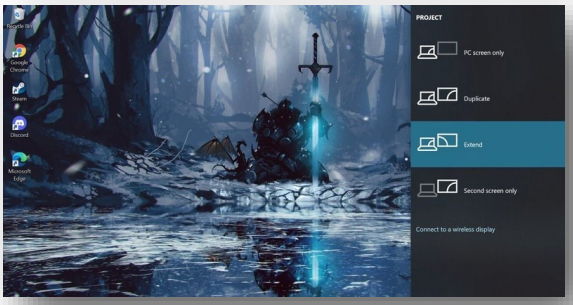
3. Scroll down and select the Projecting to this PC tab.
4. Select the first drop-down menu under "Some Windows and Android devices can project to this PC when you say it's OK"



and select Available everywhere on secure networks (in this case, your home Wi-Fi).



5. On your main PC, use the Windows Key + P shortcut to open your PC's display projection settings.
6. Select Extend from the options list. This will allow you to use your laptop as a second monitor when you project to it.
7. Select Connect to a wireless display.
8. Select your laptop when its name appears to connect to it.



Now that your PC is projecting to your laptop and you've selected the Extend option on your PC, you can use your laptop as a second monitor.

~ Windows Central

How to use your laptop as a second monitor | Windows Central

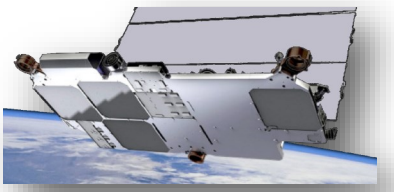
The StarLink incident…

As many as 40 Starlink satellites have fallen out of the sky--the surprising result of a minor geomagnetic storm.

"On Thursday, Feb. 3rd at 1:13 p.m. EST, Falcon 9 launched 49 Starlink satellites to low Earth orbit from Launch Complex 39A (LC-39A) at Kennedy Space Center in Florida. Unfortunately, the satellites deployed on Thursday were significantly impacted by a geomagnetic storm." Two days before launch a CME hit Earth's magnetic field. It was not a major space weather event. In fact, the weak impact did not at first spark any remarkable geomagnetic activity. However, as Earth passed through the CME's wake, some sputtering G1-class geomagnetic storms developed. It was one of these minor storms that caught the Starlink satellites on Feb. 4th.

Geomagnetic storms heat Earth's upper atmosphere. Diaphanous tendrils of warming air literally reached up and grabbed the Starlink satellites. Onboard GPS devices detected atmospheric drag increasing "up to 50% higher than during previous launches." "The Starlink team commanded the satellites into a safe-mode where they would fly edge-on (like a sheet of paper) to minimize drag. Preliminary analysis show the increased drag at the low altitudes prevented the satellites from leaving safe-mode to begin orbit raising maneuvers, and up to 40 of the satellites have reentered the Earth's atmosphere." The Sociedad de Astronomia del Caribe apparently caught one of the reentries over Puerto Rico on Feb. 7th.

A sharable permalink to this story is available here: The Starlink Incident - https://spaceweatherarchive.com/2022/02/09/the-starlink-incident/



...more Ham on the Computer

E-mail spoofing

Here at SARC we routinely provide our Directors' email addresses to our members, Basic course students, and others enquiring about our activities. That can have some negative consequences. For example, we often receive email spoofed to represent a Director asking us to provide a gift card electronically as a 'thanks' to someone. Fortunately, we are knowledgeable enough to spot this nefarious activity, but some may not, so here are some suggestions to prevent you from falling prey to a similar scam.

E-mail spoofing is when someone creates fake headers in an e-mail message intended to make the recipient believe the e-mail came from a trusted source.

If you get an e-mail from someone you know (or with whom you have dealt over e-mail), but the email seems unlikely - then it is possibly spoofed (NOT sent from the person you might think it was, but by a third party altogether). Check the "from address" carefully. E-mail spoofing is easy to set up and very difficult to stop.

While there are measures in place to prevent the spoofing of e-mails it remains a big problem worldwide. E-mail spoofing cannot be stopped by the spoofed person - only by steps in place on the receiver's side (typically your ISP can prevent the delivery of e-mail that comes from sources that do not meet strict (new) protocols - but this could also backfire and result in you losing legitimate email too). As with any e-mail - check before you open attachments or react to the contents of the email.

Examples of e-mail spoofing include (but are not limited to):

- Getting an e-mail from a friend asking for money.
- You get an e-mail stating that the sender has lost their bank card and needs to buy groceries - and asks you to please send some small amount of money - then it is probably fake and worth checking first.
- You get an offensive e-mail from someone you would not expect to be offensive. This could accuse you of something or perhaps sending

some sort of pornographic or otherwise offensive material.

- You get an e-mail from someone (typically your bank) asking you to click here to “login with your credentials...”. Do not!

Spoofing is both a cyber-crime and a “prank” and could be aimed at the recipient or the “sender.”

The recipient is “tricked” into opening attachments or revealing some information - or simply confirming your e-mail address is active and gets you added to spam lists. The “sender” is usually targeted by sending offensive e-mails to other people who then react harshly towards the “assumed” sender - who probably knows nothing of it at the time!

What to do if you suspect an e-mail is spoofed?

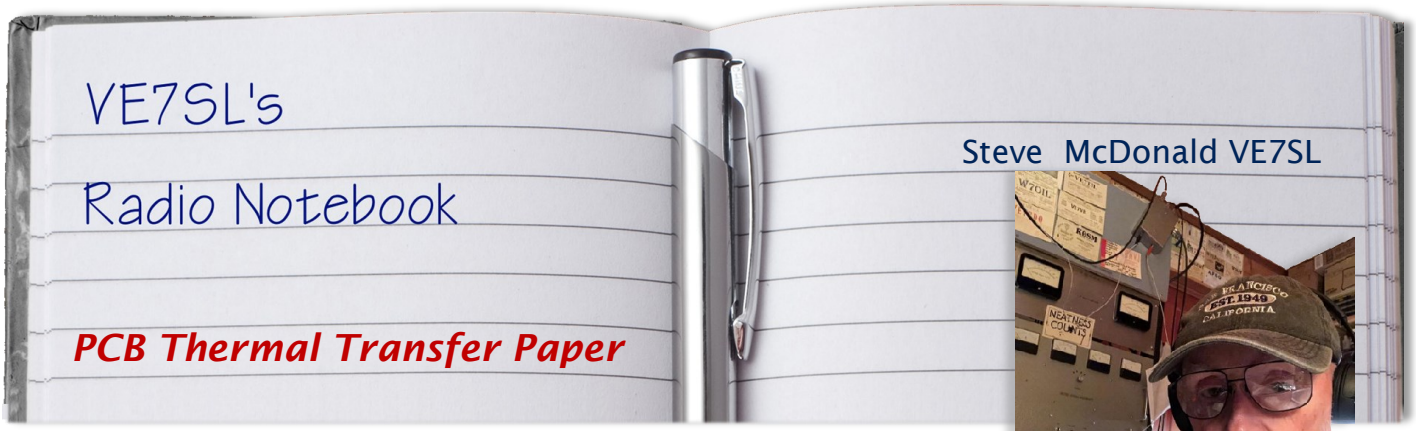
As always, do not open attachments or simply reply. Think first and probably do nothing. Send a new e-mail (do not just hit reply) to the (assumed - the person YOU know) sender to tell them about it and confirm the message’s legitimacy.

A final thought about the sender: While you might be annoyed by the incoming e-mail - there is nothing the assumed sender can do about this. If you are getting “hundreds of e-mails from Jim” be advised - Jim is not in a position to stop the emails or responsible for their content.

And finally, as with any spam, the mere fact that you respond, places you on a mailing list of known ‘good’ email addresses and you will only increase your vulnerability.

~

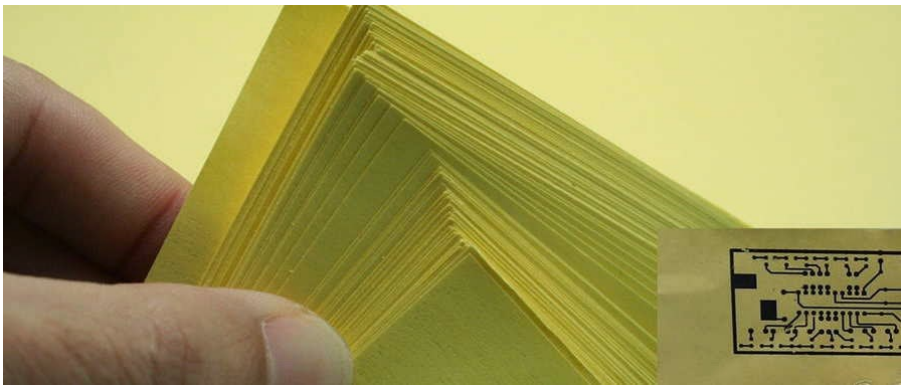
Hmmm... Distracted driving?



Steve McDonald VE7SL

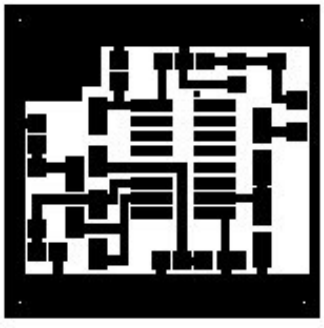
Reproduced with the author's permission, Visit The VE7SL Radio Notebook at: The VE7SL Radio Notebook and Steve's blog at VE7SL - Steve - Amateur Radio Blog

I recently had the first opportunity to try my e-Bay purchased thermal transfer paper. It was to be used in my iron-on PCB work as a hopeful improvement over what I had been using, just ordinary printer paper. Supposedly the shiny photo-quality papers were proving to be good performers but are expensive. Some have reported good results with glossy magazine paper but my one experience with that was not a pleasant one. Unknowingly, when I had removed the magazine page, a small amount of the sticky adhesive used in the binding process was still on the sheet. Running it through the printer caused it to melt and smear some of the laser cartridge's toner and for the next several weeks, any printing I did had a slight black streak along one edge… doh!



My new paper from China (free shipping!) was pretty inexpensive and if it offered even a slight improvement, would be well worthwhile. This first use of the paper would be a circuit board for my earlier test-bed GW3UEP 630m transmitter. I had finished designing a PC pattern for it, using MS Paint, and was anxious to see the results.

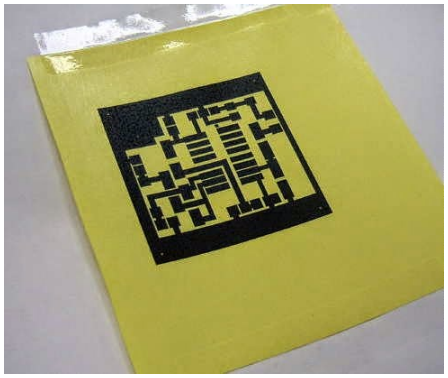
I decided to use a small separate board for the crystal oscillator-divider so at a later time I could more easily swap it out for a DDS driver. Using a separate board would allow me to do that without disturbing the rest of the transmitter.



The Communicator

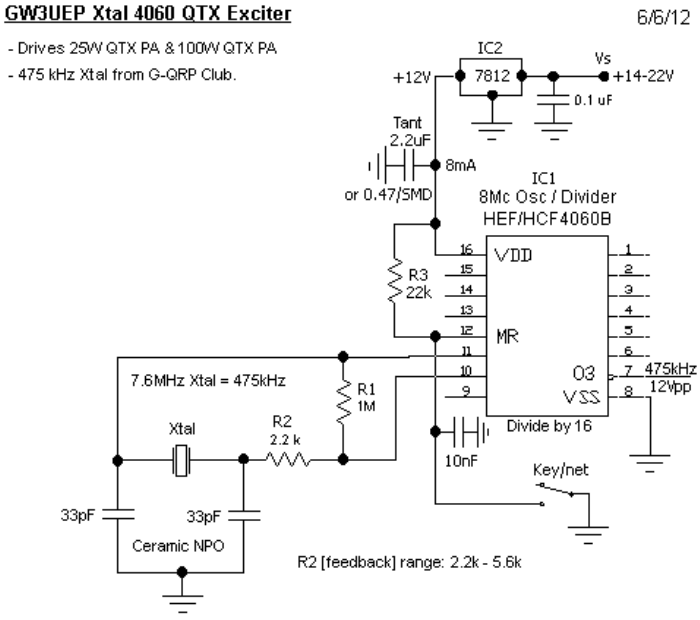
I know that a lot of folks turn up their noses at MS Paint but I have always found it to be a very versatile piece of software and have used it for making PC layouts for many years. I also use it for drawing all of the schematics appearing on my website.

After printing the pattern (printer set for maximum resolution and darkest print) and ironing-on the pattern , I allowed the board to cool for several minutes before immersing it, along with the now firmly attached yellow paper, into cold water. The first thing I noticed was how easily the paper came away from the board. It actually 'un-peeled', much like a good quality price tag sticker… you know, the ones that don't take forever and come off in tiny bits and pieces. It peeled off smoothly with no paper residue left on the board. This was a huge improvement already. There were just a few traces of toner left on the paper as almost all had been transferred to the board.

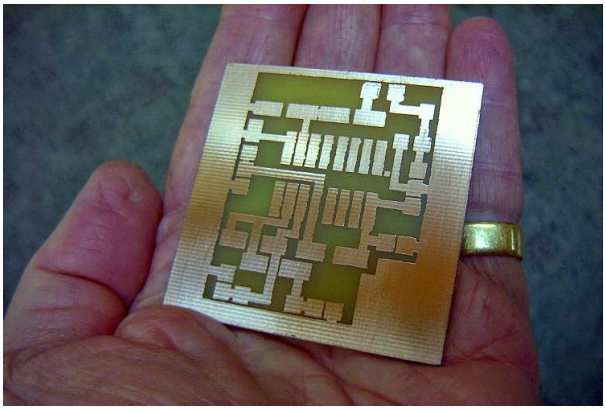


Once dried, a close examination revealed that I had pressed a little too hard with the iron and there was some evidence of 'squeeze-out' along the edges of some lines. I also found one or two very small thinner areas that probably required going over with a permanent-ink black marker pen just to make sure that those spots did not get etched. Over all I was extremely pleased with the paper and will be using it from now on.

Another recent change in my PC etching regime has been a switch from the old and messy Ferric Chloride standby to a combination of Hydrogen Peroxide and Muriatic acid. Not only does it seem to etch more cleanly (no undercutting) but it also etches very quickly and without any solution warming needed. This board was completely etched in just over 4 minutes.

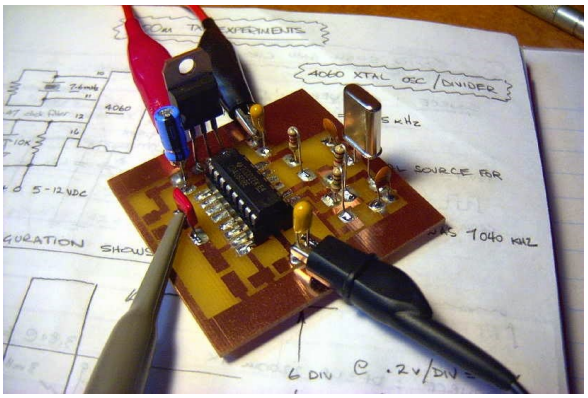


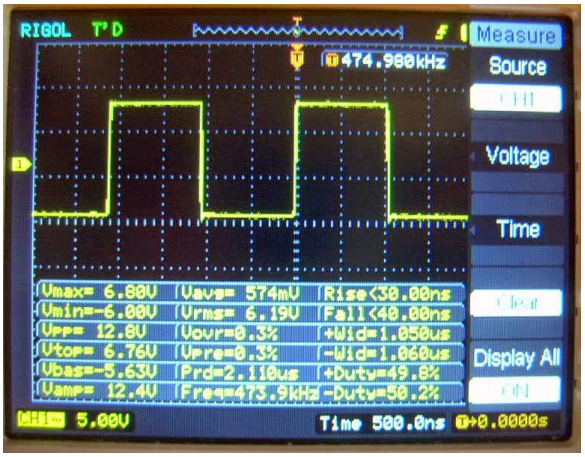
The circuit diagram.
Courtesy: http://www.gw3uep.ukfsn.org/



The chemicals used in this method are inexpensive and are readily available at the drugstore and at the hardware store. There are numerous web-descriptions of this particular etching process but this site seems to cover the basics nicely.

The completed board turned out as shown here, using the 'dead-bug' style of mounting parts:





The CD4060 not only functions as a crystal oscillator but also as a versatile frequency divider. As well as fundamental frequency output, ten different 'divide-by' functions are available depending in which output pin is chosen. These range from divide-by 16,384 to divide-by 16. This circuit uses the latter, dividing the 7.6 MHz crystal down to 475 kHz at pin 7.

In summary, I can highly recommend the e-Bay yellow thermal transfer paper when used for this method of making PCB's and is much cheaper than buying photo-quality printing paper.

~ *Steve VE7SL*

Club News, Amateur Radio Courses, Nets and Articles...

Amateur Radio Courses: https://www.rac.ca/amateur-radio-courses/

Radio Amateurs of Canada is pleased to continue to promote Amateur Radio Courses – including Basic, Advanced and CW – which are being organized by clubs so please send them to us. For example, the Surrey Amateur Radio Communications (SARC) in partnership with the Surrey Emergency Program Amateur Radio (SEPAR), has an online class starting on **March 21 at 6:30pm**.

Heil Sound announces new ownership

Heil Sound, the Fairview Heights, Illinois-based manufacturer of professional microphones, has announced the successful transfer of ownership from Bob and Sarah Heil to current President and CEO, Ash Levitt, and Director of Operations, Steve Warford. Sarah Heil has retired, but Bob will continue to do outreach work and product design within the amateur radio space under the title Founder and CEO Emeritus.

When discussing the transition, Heil said, "My life has been about achieving great sound, whether on the concert stage or in the amateur radio world. I've watched Heil Sound go from a regional sound company to a world-class microphone manufacturer. This company has been my passion but it is time for me to step aside. There is no better team to carry the company forward than Ash and Steve, and I have the utmost confidence in them."

~ *https://grznow.com/heil-sound-announces-new-ownership/*

No-Ham Recipes

Nilay Mine Aydogmus TA3YJ

Turkish Saffron Pudding (Zerde)

Pudding Filling:

- 1/4 cup (65 ml) short grain white rice, rinsed
- 2 tablespoons (30 ml) rose water
- 3/4 cup (200 ml) granulated white sugar
- 1/2 teaspoon saffron (2.5 ml) soaked in 2 tablespoons (30 ml) warm water
- 3 tablespoons (45 ml) corn starch, dissolved in 3 tablespoons (45 ml) tepid water

Garnish:

- 4 tablespoons (60 ml) ground pistachios
- 2 tablespoons (30 ml) currants, soaked in 1/4 cup hot water
- 4 tablespoons (60 ml) pine nuts, lightly toasted

This delicately flavoured pudding, served cold, with its mixture of soft and crunchy toppings and beautiful colours, is a wonderful treat on a hot summer evening. Makes 6 servings.

Boil the rice in 3 cups (750 ml) of water, and then drain any water remaining in pot. In a separate pot, add the sugar to 3 cups (750 ml) of water and bring to a boil. When it boils, decrease heat to medium-low. Add the cooked rice, the saffron and water mixture, and the liquefied corn starch. Stir constantly so the mixture doesn't stick to the pot bottom and burn. As the mixture begins to bubble, cook one minute more, and add the rose water, but don't stop stiring until the minute is up.

Remove the pot from the heat and pour the pudding into individual serving bowls. Top each bowl of pudding with equal quantities of pine nuts, currants and pistachios. Fresh pomegranate, if available, is also good added to the other toppings. Chop it into small bits and sprinkle onto the pudding. Allow pudding to cool somewhat before refrigerating. Serve cold.

~ Nilay TA3YJ

Foundations Of Amateur Radio

Onno Benschop
VK6FLAB

The inherent redundancy of a compromise antenna

To listen to the podcast, visit the website: http://podcasts.vk6flab.com/ . You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

For an activity that's seeped in the art of communication, amateur radio is a diverse collection of people, joined by a common interest and kept together using imperfect language describing an intrinsically complex science in the hope that we can learn from each other to get on air and make noise.

In this cooperative endeavour, language is important.

Let me start with a limerick by Arthur Frackenpohl:

There was a young fellow of Perth Who was born on the day of his birth He married, they say On his wife's wedding day And died when he quitted the earth

Stay with me.

In this day and age, first and foremost, let me give you a short summary, cobbled together from bits and pieces of a new invention, conceived whilst watching the evening sunset in close proximity to the beach.

What this cornucopia of tautologies has to do with our hobby might not be obvious, but let me illustrate.

Consider the phrase: "a compromise antenna", as-in, "Oh, I'd never use that antenna, it's a compromise antenna."

If you've been in this community for any time at all, you'll have heard that phrase and unless someone pointed it out, you might not have realised that it's essentially unhelpful.

Why?

Because as I've said many times before, all antennas are a compromise, by definition. This is true at several levels.

At a fundamental level, an isotropic antenna is a theoretical antenna that radiates equally in all

directions - horizontally and vertically with the same intensity. It's infinitely small and operates on all frequencies with infinite bandwidth. It should be obvious, but this antenna cannot physically exist, so every built antenna represents a collection of trade-offs or compromises and no antenna can radiate more total power than an isotropic antenna.

Beyond that, within the physical constraints of antenna building there are many more compromises. Now this might not be immediately obvious, so let me elaborate.

Consider a 28 MHz, seven element Yagi antenna. With a 12m boom, a 5.3m reflector element, a turning circle of 7.5m and weighing in at 53 kilo. At 20m above the ground it has a gain of 17.5 dBi and handles 1.5 kW. It's physically capable of withstanding 180 km/h winds. It's a lovely piece of kit and if you have the space, it's absolutely something you might want to receive for your birthday and bolt to a mast somewhere near your radio.

If all antennas are a compromise, you might ask yourself, how is this beautiful 10m Yagi a compromise?

For starters, its total radiated power is less than an isotropic antenna. It works between 28 and 29 MHz, but nowhere else. It radiates signals really well in one direction, but not in any other. It requires lots of open space and as a fixed installation, it must be on a heavy duty rotator clamped to a tall mast. To actually acquire and install requires more funds than I've spent on all my radios to date.

Some of what I've mentioned might be acceptable to you, some not. For example, if you're always portable, this antenna makes no sense. You make choices to select an antenna that's best suited to the job and in doing so, you are introducing compromises.

Additionally, there are amateurs who would have you believe that a compromise antenna is one with high loss.

High loss in comparison to what?

If you live in an apartment block, there's no way that you can fit that 10m Yagi inside your bedroom, so you compromise and use a magnetic loop antenna instead. If you're on the top of a mountain, there's no opportunity to erect a structure, so you use a self-supporting vertical. If you're in a car, you cannot erect a horizontal dipole and drive down the highway, so you bolt a whip to your jalopy.

All of the choices you make to fit a purpose, an environment, a budget and available material will combine into an antenna that hopefully gets you on air making noise.

When someone tells you that an antenna is a compromise antenna, what they're really saying is that you made compromises that they're unwilling to make. That's easy to say if you have infinite space, money, experience and opportunity. In other words, they're just blowing hot air.

The whole point of antenna building is to find a particular set of compromises that suits your situation at the time that you're doing it. The intent of this hobby is to learn what the impact of a particular choice is and how it affects the operation of an antenna in a specific situation.

Next time you hear the redundant phrase "that's a compromise antenna", ask what compromises they are describing that they don't accept and decide for yourself if they are compatible with what you're attempting to achieve within the resources available to you.

~ I'm Onno VK6FLAB

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

How to run an SSB contest without using your voice...

As you might know, I consider myself a contester. I derive great pleasure from getting on air and making noise during a contest. It gives me a wonderful opportunity to test my station, hone my skills and work on learning something new every time I participate.

Due to circumstances I've been away from contesting for a number of years, but recently I was able scratch my itch from my own shack. For 24 glorious hours I was able to make contacts from the comfort of my home, being able to make a cup of tea, eat some dinner, stay warm, catch a nap when the bands were closed and generally have a blast.

My set-up worked well. Operating QRP or low power, I used a basic contest logger, since I wasn't expecting to be making many contacts. To automatically call CQ, I recorded my voice and set-up a script that played the audio, waited four seconds, then played it again. Using my audio mixer, I could turn that on and off at will and between that and the headset I was wearing I had loads of fun and even made contacts!

During the last three hours of the contest my partner came home. After hearing me attempt to confirm an exchange for a while, it became apparent that making exchanges, calling CQ and generally talking out loud was going to be an issue in our home, since my shack is within hearing range of the entire house. That or I'm going deaf and my voice is getting louder. I do get excited from time to time!

For the past several months I've been trying to find a solution and until today I wasn't getting any closer.

I didn't think I was asking for too much.

I'm looking for a contest logger, that runs on Linux, that has the super check partial database, knows the contest rules and most importantly, has a voice keyer with the ability to actually voice the exchange itself, as-in, not a pre-recorded audio file, but the ability to speak any callsign and any exchange.

As an aside, the super check partial database is a list of frequently heard contest callsigns, originally introduced by Ken K1EA, which if used properly, helps you when you're deciphering a callsign on a noisy band. Using it to guess calls and make mistakes can result in significant penalties for some contests.

The only tool I've come across that does all this in any way is N1MM. It runs on Windows and I have to tell you, the idea of having to buy a new computer,

just to run a supported version of Windows just doesn't do it for me. N1MM also doesn't use Hamlib, so my radio needs to be physically connected to the computer. I won't bore you with my weeks of attempts, but it became farcical.

During my months of exploration I looked at and tried plenty of other tools. Many of them aren't intended for contesting, don't have access to the super check partial database, don't do voice-keying, don't run under Linux, require weird bits of extra software, have little or no documentation and a myriad of other issues like having to compile from source with arcane library requirements, the list goes on.

One contender that got close was a text only tool called TLF. It got so close that I almost used it for my previous contest. In the end I didn't because it was doing unpredictable things with the display and I had to write my own contest rule file for an unsupported contest which I couldn't test in time to actually use.

Today I took another look.

TLF doesn't have a voice-keyer on board, but it does have the ability to interface with a Morse-keyer, which is interesting, since it implies that there is a process that translates callsigns and messages typed in with a keyboard into Morse, which might mean that it may be possible to pretend to be a Morse-key and make voice sounds instead.

The Morse-keyer software in question is cwdaemon. It accepts text messages from TLF and then converts those into Morse code and then directly controls your radio to generate dits and dahs on-air.

I started digging through the source code when I realised that cwdaemon might have a debug mode that shows what it's doing. Turns out, not only does it have a debug option, you can also prevent it from keying your radio. Which means that I should be able to get TLF to generate the messages, cwdaemon to show those messages and me to do something useful, like play audio files as appropriate.

If I pull this off, it will mean that I can operate my station as if I'm running CW, but the radio will be transmitting voice, which makes for a beautiful way to save my vocal chords whilst running a contest without bothering anyone else and do this without needing to install Windows, which frankly, in my book is a win.

If I succeed, and I think the odds are good, I'll publish my efforts on my github repository for you to use, if you're so inclined.

I have to confess, when I started this adventure, I was not at all convinced that I could make this happen and I'd all but thrown in the towel. It still quite unbelievable to me that this kind of thing doesn't appear to exist, but if all goes well, it should soon.

What are you going to be doing for your next contest?

~ I'm Onno VK6FLAB

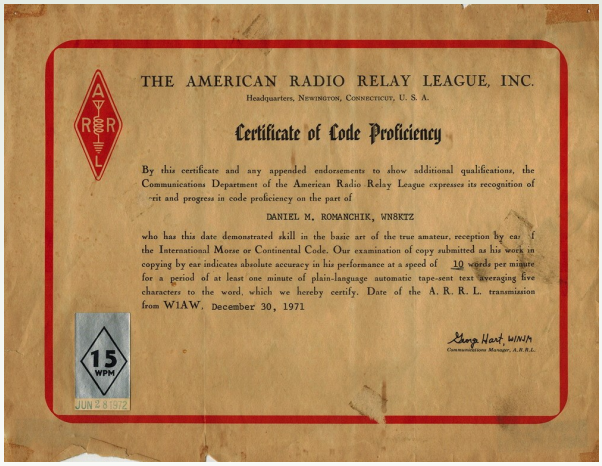
...If I pull this off, it will mean that I can operate my station as if I'm running CW but the radio will be transmitting voice

KB6NU's Column

Dan Romanchik, KB6NU

You never know what you're going to find…

I was puttering around the shack yesterday, putting some stuff away and throwing out stuff that I've either finished with or will probably never get back to. In doing so, I ran across this:



THE AMERICAN RADIO RELAY LEAGUE, INC.
Headquarters, Newington, Connecticut, U. S. A.

Certificate of Code Proficiency

By this certificate and any appended endorsements to show additional qualifications, the Communications Department of the American Radio Relay League expresses its recognition of merit and progress in code proficiency on the part of

DANIEL M. ROMANCHIK, WN6KTZ

who has this date demonstrated skill in the basic art of the true amateur, reception by ear of the International Morse or Continental Code. Our examination of copy submitted as his work in copying by ear indicates absolute accuracy in his performance at a speed of 10 words per minute for a period of at least one minute of plain-language automatic tape-sent text averaging five characters to the word, which we hereby certify. Date of the A. R. R. L. transmission from W1AW, December 30, 1971

George Hart, W1NJM
Communications Manager, A.R.R.L.

15 WPM
JUN 2 8 1972

It's hard to read, but the date of the 15 wpm endorsement is "JUN 28, 1972, almost 50 years ago! I think that, just for fun, I'll try to qualify for the 30 wpm endorsement.

The certificate itself is really brittle, but I don't want one of the new ones. I don't like the way they look with the Vibroplex key on them. Maybe I can have this one laminated.

While I was at it, I decided to re-organize my small collection of ARRL Handbooks.

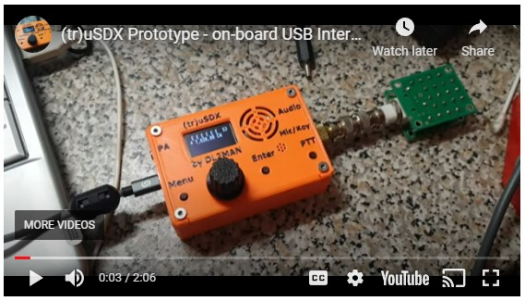
As you can see, I have the 1949, 1958, 1963, 1965, 1975, 1976, 1977, 1979, 1981, 1985, 1986, and 2000 Handbooks. Not shown is the six-volume 2022 Handbook that I purchased a couple of months ago.

Paging through these Handbooks really gives one a sense for the history of the hobby. For example, the 1948 Handbook has a chapter on broadcast interference (BCI). Now, we'd call that radiofrequency interference (RFI) or electromagnetic interference (EMI). Also, I didn't find any information on RF exposure in the 1948 Handbook.

~ *Dan KB6NU*

Amateur radio videos: (tr)uSDX

So, a couple of days ago, a guy in our club posted to our mailing list that he was thinking of starting a group buy for the (tr)uSDX transceiver and included a link to the video below:



Here's a description of the little transceiver:

The (tr)uSDX is a 5-Band / Mulitmode QRP Transceiver in Pocket Format (90x60x30mm – 140g). It features a highly efficient Class E PA and Supports CW/LSB/USB and AM/FM. Right now it covers 80/60/40/30/20m and in Future there will be support for 17/15/12/10m as well.

It is supplied with an OLED Display, onboard Mic, (tiny) onboard speaker and for improvised QSO onboard PTT Key can be used as emergency CW Key. Further on, the (tr)uSDX has a (Micro)USB CAT and Programming Interface, and while it produces typically 5W @ 13.8V Power Supply, it can create 0.5W Output from 5V USB Supply alone.

Typically it draws 80mA on RX (with MS5351 – less with Si5351) and 500mA on TX @13.8V and typical 85% PA Efficiency. It is supplied with OnBoard SWR Bridge and Voltage/Current measurement Hardware, to help in tuning and operation.

Talking about the on-board test equipment, here's a short video on how that works:

The guy says that if we do a group buy, they'll cost about $60. That seems pretty cheap, since in single unit quantities, they're selling for closer to $100. Here's a video of the designer unboxing a kit from one of the Chinese suppliers:

I don't know where the guy is going to be making the group buy, more than a dozen club members have signed up so far. I need another project like I need a hole in the head, but I'm going to get one, too.

~ *Dan KB6NU*

When he's not trying to figure out which way current flows, Dan blogs about amateur radio at KB6NU.com, teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com.

Ham Leftovers...

The Slow Morse Club

As membership of the Slow Morse Club surpasses eight thousand this is a little reminder to those who might be thinking of joining the apparent renaissance of CW operating.

The club welcomes all who are interested in operating slow CW on air regardless of ability in the mode. For the more experienced there is the chance to coach and for the newbies, the chance to learn, and more importantly, use CW on air perhaps for the first time.

Radio Signals… a video guide to passing the Amateur Radio exam

If you are looking for a self-study course for the basic exam, RadioSignals has a site with instructional videos that you may find useful. Keep in mind that, while the technical information is universal, regulations and procedures may vary from country to country. The regulations presented here are for the United States.

How to capture satellite images

Sophie Dyer M6NYX and Sasha Engelmann M6IOR have written an article about how they used amateur radio tech to capture and decode images from NOAA Satellites for #COP26 – and how you can do the same.

Each member of the group recorded a satellite image as well as what they could feel and observe of the weather on the ground. Across 14 countries and six continents, the network recorded a total of 38 images which, when stitched together onto a map, produced a snapshot of the planet on October 31 2021."

Read the full article at https://theconversation.com/how-to-capture-satellite-images-in-your-backyard-and-contribute-to-a-snapshot-of-the-climate-crisis-167327

What a collection of old radios!

Richard Allan, a retired electrical engineer, has spent the last fifty years collecting antique transistor, valve and crystal sets and has now shown off his impressive collection of more than 200 pieces. See https://www.dailymail.co.uk/news/article-10522803/Retired-electrical-engineer-85-15-000-collection-200-antique-radios.html and you can read more at http://www.richardsradios.co.uk/g2awa.html

Amateur radio in 60 seconds

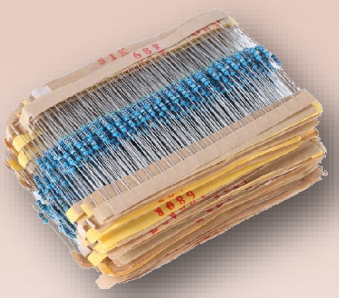
Richard G3CWI has been making a series of short videos covering topics such as the characteristics of each HF band, and questions raised by newer radio hams as well as tips for the more experienced. He aims to produce one video each day! https://www.youtube.com/c/g3cwi_Radio_Adventures/videos

More Ham

Is Walmart the next Radio Shack?

Chris K0CJG, has alerted us to the on-line offerings from Walmart. Try Googling "Walmart electronic components" Then do a search for a specific item, like "RF Mixers". You will be shocked by the number of items they offer. It looks like they are offering usually 3 day shipping. Items don't seem to be stocked in Walmart warehouses, but most are sold and shipped from many different small store fronts, a lot of them in China.

Walmart is obviously now trying to beat Amazon, E-Bay, Alibaba, etc. at their own game. However, their search engine will oftentimes come up with some really weird results. And some product descriptions are definitely written in Chinese English.

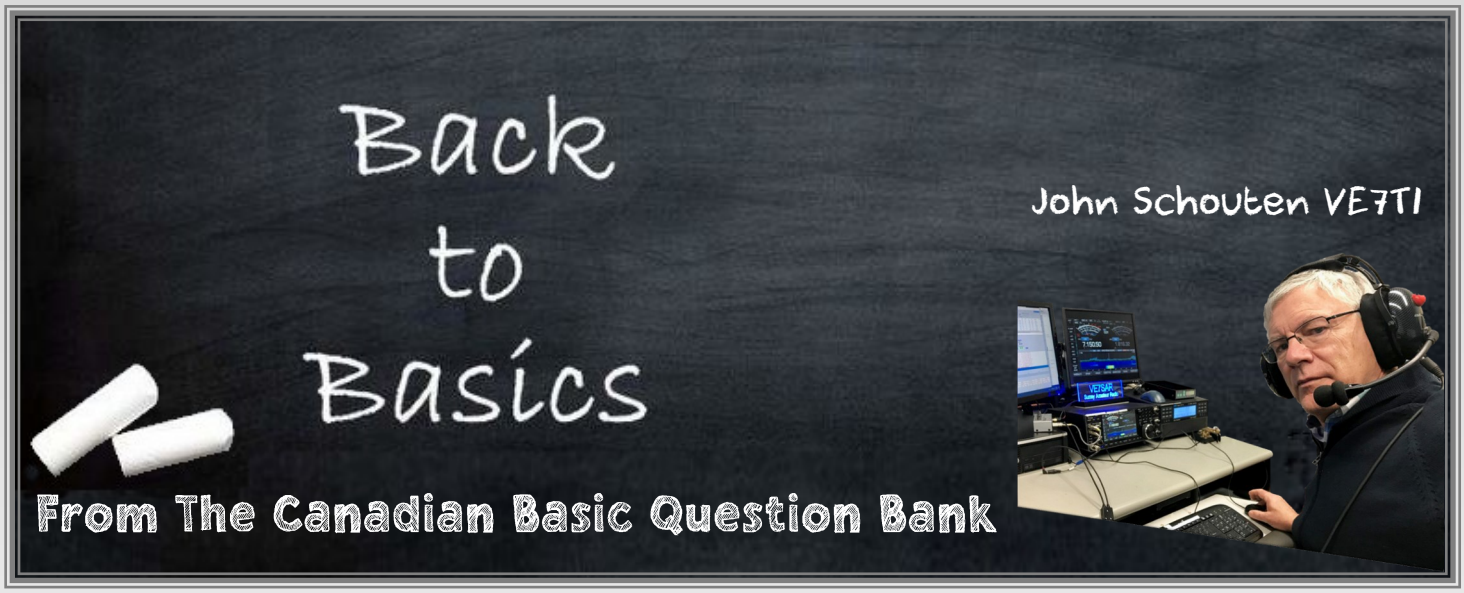


~ Courtesy Boulder Amateur Television Club TV Repeater's REPEATER Newsletter

How about this for your next shack?

Zen and the art of working from home…

Japanese builder offers mini office kit.



More on multimeters

I'm sometimes surprised when a fellow ham asks a troubleshooting question and they have no knowledge of simple voltage, current or resistance measurement. This issue we will examine combined meters for volts, current and resistance, collectively known as a multimeter; and how to connect them to a circuit.

Our sample question this issue is one of several in the Canadian Basic Question Bank:

B-5-13-3 What does a multimeter measure?

A Voltage, current and resistance

B Resistance, capacitance and inductance

C Resistance and reactance

D SWR and power

When instructing the Basic course I spend a fair bit of time on series and parallel circuits and the means to make basic measurements, and there are several questions in the question bank that test these skills. I use my own multimeter several times a week, to check for a short, open circuit or even whether a dry cell battery requires replacement. This month we'll look at the meters themselves… next month the basics of how to use them.

Multimeters or multitesters, also known as a VOM (Volt Ohm Meter) is an electronic measuring instrument that combines several measurement functions in one unit. They are inexpensive and very handy tools for measuring what is going on in a circuit and will offer Voltage, Current and Resistance ranges adequate for home use. Most new multimeters are digital. Until recently, digital multimeters were expensive, and some lab quality instruments still are, as much as $5,000. For as little as $10 you can purchase one on-line or on sale at Canadian Tire. The average home user can get by with a basic model.

History

The first moving-pointer current-detecting device was the galvanometer in 1820. These were used to measure resistance and voltage by using a resistor bridge, and comparing the unknown quantity to a reference voltage or resistance. While useful in the lab, the devices were very

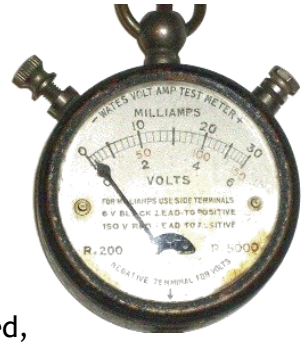
slow and impractical in the field. These galvanometers were bulky and delicate. By adding a series or shunt resistor, more than one range of voltage or current could be measured with one movement.

Multimeters were invented in the early 1920s as radio receivers and other vacuum tube electronic devices became more common. The invention of the first multimeter is attributed to British Post Office engineer, Donald Macadie, who became dissatisfied with having to carry many separate instruments required for the maintenance of the telecommunications circuits. Macadie invented an instrument which could measure amperes, volts and ohms, so the multifunctional meter was then named Avometer. The meter comprised a moving coil meter, voltage and precision resistors, and switches and sockets to select the range.

Any meter will load the circuit under test to some extent. For example, a microammeter with full-scale current of 50 microamps, the highest sensitivity commonly available, must draw at least 50 microamps from the circuit under test to deflect fully. This may load a high-impedance circuit so much as to affect the circuit, and thereby give a false low reading.

To eliminate loading, Vacuum Tube Voltmeters (VTVM) were used for voltage measurements in electronic circuits. The VTVM had a fixed input impedance of typically 1 megohm or more, usually through use of a vacuum tube input circuit, and thus did not significantly load the circuit being tested. Modern digital meters and some modern analog meters use electronic input circuitry to achieve high-input impedance—their voltage ranges are functionally equivalent to VTVMs. Before the introduction of digital electronic high-impedance analog transistor and field effect transistor (FETs), vacuum tubes were commonly used.

How Does It Work?



An un-amplified analog multimeter combines a meter movement, range resistors and switches. For an analog meter movement, DC voltage is measured with an internal series resistor connected between the meter movement and the circuit under test. If no resistors were used, the excessive voltage or current would quickly burn out the small wires that make up the meter coil. A set of switches allows greater resistance to be inserted for higher voltage ranges. As an example, a meter movement that required 1 milliamp for full scale deflection, with an internal resistance of 500 ohms, would, on a 10-volt range of the multimeter, require 9,500 ohms of series resistance. Why? Remember Ohms Law, R = E / I or 10 volts divided by .001 amp which equals 10,000 ohms. The meter has an internal resistance of 500 ohms so we must add series resistance of 9,500 ohms to obtain a full scale reading. Now any voltage between 0 and 10 volts will produce some proportional deflection of the meter and this value can be read from the scale.

For analog current ranges, low-resistance shunts are connected in parallel with the meter movement to divert most of the current around the coil. Again for the case of a hypothetical 1 mA, 500 ohm movement on a 1 Ampere range, the shunt resistance would be just over 0.5 ohms.

Moving coil instruments respond only to the average value of the current through them. To measure alternating current, a rectifier diode is inserted in the circuit so that the average value of current is non-zero.

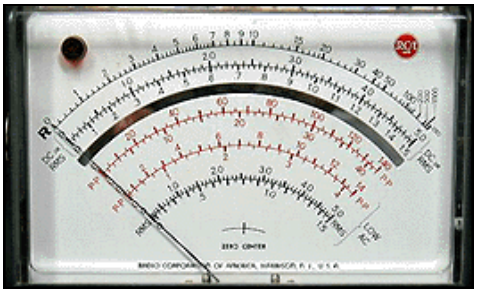
To measure resistance, a small dry cell within the instrument passes a current through the device under test and the meter coil. Since the current available depends on the state of charge of the dry cell, an analog multimeter

A online course provided by Fluke!!!!!! - Good for basic Multimeter use

FACT | Digital Multimeter Basics (Online) | Course Introduction (talentlms.com)

usually has an adjustment for the ohms scale to zero it, to compensate for the varying voltage of the meter battery. In the usual circuit found in analog multimeters, the meter deflection is inversely proportional to the resistance; so full-scale is 0 ohms, and high resistance corresponds to smaller deflections. The ohms scale is compressed, so resolution is better at lower resistance values. Inexpensive analog meters may have only a single resistance scale, seriously restricting the range of precise measurements.

Resolution of analog multimeters is limited by the width of the scale pointer, parallax, vibration of the pointer, the accuracy of printing of scales, zero calibration, number of ranges, and errors due to non-horizontal use of the mechanical display. Accuracy of readings obtained is also often compromised by miscounting division markings, errors in mental arithmetic, parallax observation errors, and less than perfect eyesight. Mirrored scales and larger meter movements are used to improve resolution; two and a half to three digits equivalent resolution is usual and adequate for the limited precision needed for most measurements.



An analog multimeter. Note the scales used for voltage, current and resistance readings. The needle swings proportionately to the right, activated by a current passing through a small electro-magnetic coil. The mirror between the scales is used to line up the needle to avoid parallax errors caused by looking at the indication on the scale at an angle.

Analog meter movements are inherently much more fragile physically and electrically than digital meters. Many analog meters have been instantly broken by connecting to the wrong point in a circuit, or while on the wrong range, or by dropping onto the floor.

On the favourable side, Analog meters are able to display a changing reading in real time, whereas digital meters present such data in a manner that's either hard to follow or more often incomprehensible. Also a digital display can follow changes far more slowly than an analog movement, so often fails to show what's going on clearly.

Analog meters are also useful in situations where its necessary to pay attention to something other than the meter, and the swing of the pointer can be seen without looking at it. This can happen when accessing awkward locations, or when working on cramped live circuitry.

Analog displays are also used to very roughly read currents well above the maximum rated current of the meter. For this, the probes are just touched to the circuit momentarily, and how fast the pointer speeds towards full-scale deflection is noted. This is often done when testing state of charge of dry batteries.

The ARRL handbook also says that analog multimeters, with no electronic circuitry, are less susceptible to radio frequency interference, important if working on radio gear.

Digital Meters

The first digital multimeter was manufactured in 1955 by Non Linear Systems. Modern multimeters are often digital due to their accuracy, durability and extra features. In a digital multimeter the signal under test is converted to a voltage and an amplifier with electronically controlled gain preconditions the signal. A digital multimeter displays

the quantity measured as a number, which eliminates mechanical errors. Measurement enhancements available include:

Auto-ranging, which selects the correct range for the quantity under test so that the most significant digits are shown. For example, a four-digit multimeter would automatically select an appropriate range to display 1.234 instead of 0.012, or overloading. Auto-ranging meters may include a facility to 'freeze' the meter to a particular range, because a measurement that causes frequent range changes is distracting to the user. Other factors being equal, an auto-ranging meter will have more circuitry than an equivalent, non-auto-ranging meter, and so will be more costly, but will be more convenient to use. An other reason to 'freeze' the range is that this somewhat avoids 'hunting' which is a situation where the meter continuously switches between two neighbouring ranges as when the instrument is in the low range, the value is too large but too small in the larger range.

Auto-polarity for direct-current readings, shows if the applied voltage is positive (agrees with meter lead labels) or negative (opposite polarity to meter leads).

Sample and hold, which will latch the most recent reading for examination after the instrument is removed from the circuit under test.

Current-limited tests for voltage drop across semiconductor junctions. While not a replacement for a transistor tester, this facilitates testing diodes and a variety of transistor types.

As you can see, not all meters are created equally and the choice depends upon your needs. For general home use however, a $10 digital multimeter will accomplish most tasks with the least possibility of damage to the circuit or the meter.

So back to our sample question…

B-5-13-3 What does a multimeter measure?

The correct answer is A. Voltage, current and resistance

Next month we'll continue our look at the multimeter and examine some common measurements and tips on their use in your home and shack.

~ John VE7TI

Calling all New Amateurs: Get your Name in Lights!

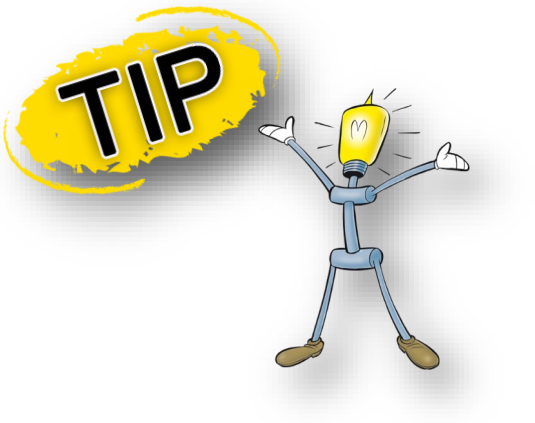
Did you get your Amateur Radio certficate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to tcamag@yahoo.ca and tell us how you were introduced to the magic of Amateur Radio.

Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

Please be sure to include your name, call sign, date and level of certificate – and don't forget to include a photo or two. We hope to hear from you soon!

Do you need more information about our courses?



Study Links for more information

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:

1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB
2. Industry Canada (ISED) on-line practice page: https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/
5. VE3YT has an excellent question-based guide available at ve3yt.com

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year free as a SARC prospective member!

Newly Licensed? When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.

HAMpuzzle V1.2

Our new students are often confused by the block diagrams for receivers and transmitters. A freeware program to practice assembling block diagrams for the Canadian Amateur Radio Basic certification exam runs under Microsoft Windows (but also works flawlessly on Ubuntu 10.04 + Wine 1.2.2)

HAMpuzzle V1.2 (2014 04) https://www.rac.ca/wp-content/uploads/2014/04/HAMpuzzle/HAMpuzzle12.zip

Be sure to download at least one set of Diagrams from the web page and deposit the bank(s) in the same folder as the program. For Basic: https://www.rac.ca/wp-content/uploads/2014/04/HAMpuzzle/HAMpuzzle_Diag_Basic.zip

Radio Amateurs of Canada is pleased to make the HAMpuzzle© program available and extends sincere thanks and congratulations to François Daigneault, VE2AAY, for writing and providing it as freeware to anyone wishing to download it.

~ RAC

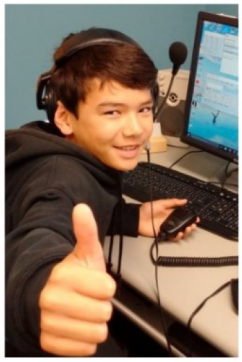
SURREY AMATEUR RADIO basiccourse

OBTAIN YOUR FEDERAL AMATEUR RADIO CERTIFICATE

7-WEEKS · ON-LINE · $80

Next course starts March 21st — contact sarc@ve7sar.net

Includes classes, a comprehensive manual, videos and the exam fee



- **Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure**
- **Use satellite communication to speak around the world, perhaps even to an astronaut**
- **Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts**
- **Enhance your personal and your community's preparedness in an emergency**
- **Use a radio, computer, smartphone or tablet for free worldwide voice and digital communications**
- **Practice an exciting hobby or start a career opportunity**

City of Surrey separ Surrey Emergency Program Amateur Radio

https://separ.ca/

SARC Surrey Amateur Radio Communications

http://ve7sar.net

More information needed? Click: https://bit.ly/SARCcourses or use the QR code above

80M ARDF Equipment

Always find the Source

80M Fox transmitter

Contact John VA7XB for pricing and availability - JohnVA7XB@gmail.com
Cost CAD $99 + Shipping

The new ARDF fox is a highly configurable transmitter with the following features:

- Configurable using a serial terminal through the USB port on a PC
- Configurable call sign identification, CW speed and repetition frequency
- Adjustable fox number from 1 sending "MOE" to 5 sending "MO5"
- Configurable transmission modes
  - Standard (10wpm, on 1 min, off 4 min)
  - Alternate (10wpm, on 1 min, off 1 min)
  - Sprint (10wpm, on 12 s, off 48 s)
  - Fast sprint (15wpm, on 12 s, off 48 s)
- Beacon mode sending "MO" at 10wpm continuously
- Spectator mode sending "S" at 15wpm continuously
- Low battery mode sending MOx once every 5 minutes
- Start of event timer configurable up to 120 minutes
- Start button to synchronize multiple foxes
- Optional short pre-event transmissions one hour before the event start with configurable CW speed
- Flashing LED showing status
  - waiting to begin delayed start – rapid flashing
  - running – on continuously
  - CW transmissions – flashing with CW timing
- Debug mode providing progress reporting via the terminal

Frequency: 3.579 MHz; Range: 300 m

Long Range (1300m) factory option available at extra cost - Contact us

The TX80M is a joint project of Les Tocko VA7OM, Dave Miller VE7HR and Chris Scholefield

The TX80M manual is available at: http://www.rx80m.com/resources/ARDF-TX-Instruction-Manual---1.003.pdf

Both the TX and RX can be ordered from JohnVA7XB@gmail.com.

RAC Amateur of the Year 2021: Hiroshi Takahashi, VA7LET

Radio amateur de l'année de RAC pour 2021 : Hiroshi Takahashi, VA7LET

The RAC Board of Directors takes great pleasure in selecting Hiroshi Takahashi, VA7LET, as the recipient of the RAC Amateur of the Year Award for 2021.

Through the RAC Amateur of the Year Award, Radio Amateurs of Canada recognizes the outstanding contributions made by Canadian Amateurs. The RAC Board considers nominations for the RAC Amateur of the Year Award and presents it if and when the nomination demonstrates the exceptional contribution made. If there are several nominations the best for that year is approved.

Hiroshi Takahashi, VA7LET, has made a significant contribution to the Amateur Radio community in Vancouver, British Columbia.

He was highly active with the Vancouver Emergency Community Telecommunications Organization (VECTOR), which operates the Amateur Radio program that supports the Vancouver Emergency Management Agency and raises the communication preparedness of the community.

Hiroshi's contributions to Amateur Radio include the following:

- Coordinating VECTOR's Basic Amateur certification course from 2014 to 2020, helping 800 people become Amateurs in two to three courses each year
- Coordinating VECTOR's civic service operations from 2014 to 2019 with Gary Webb, VA7GMW and Mike Watkins, VE7WV, including activations at the annual Celebration of Light, Canada Day and Santa Claus Parade events
- Serving as VECTOR Vice-President from 2014 to 2019
- Coordinating VECTOR's annual exercises from 2012 to 2016
- Coordinating VECTOR's Field Day setup from 2013 to 2019 with Gary and Mike
- Sponsoring and operating VE7RVU, a local 440 MHz repeater
- Helping to maintain the VE7RVZ repeater, a local 2 metre repeater
- Inspiring and coordinating the local 2 metre QSO Party starting in 2019

In 2021, Hiroshi founded the Lower Mainland Radio Room (LMRR) to focus on the "fun" in radio technology to get more people on the air and inspire existing Amateurs to discover new ways they can use their radio.

For more information about the RAC Amateur of the Year Award visit:

https://wp.rac.ca/rac-amateur-of-the-year/

~ Phil A. McBride, VA3QR/VA3KPJ
RAC President and Chair

March 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 1930 SEPAR Net 2000 SARC Net **Basic Course Exam Night**	2	3	4	5 Coffee: 730-930 AM @ Denny's 6850 King George Blvd., Surrey OTC Open—10-Noon CONTEST: ARRL International DX (SSB)
6 CONTEST: ARRL International DX (SSB)	7	8 1930 SEPAR Net 2000 SARC Net	9 **SARC General Meeting** **(Zoom)** **1900-2100**	10	11	12 Coffee: 0730-0930 @ Denny's OTC Open—10-Noon CONTEST: OK, ID QSO Party & VA QSO Party
13 CONTEST: OK, ID QSO Party & VA QSO Party & WI QSO Party	14 CONTEST: WI QSO Party	15 1930 SEPAR Net 2000 SARC Net	16	17 **SEPAR Meeting**	18	19 Coffee: 0730-0930 @ Denny's OTC Open: 10-Noon CONTEST: BARTG RTTY Contest
20 CONTEST: BARTG RTTY Contest	21 On-line Basic Course 19:00 hrs	22 1930 SEPAR Net 2000 SARC Net	23 **1900 SARC Exec Meeting**	24	25	26 Coffee: 0730-0930 @ Denny's OTC Open—10-Noon Contest: CQ WW WPX (SSB)
27 Contest: CQ WW WPX (SSB)	28 On-line Basic Course 19:00 hrs	29	30	31		

For details on all SARC events, go to ve7sar.net

Contest Details: http://hornucopia.com/contestcal/contestcal.html

April 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	For details on all SARC events, go to ve7sar.net				1	2 Coffee: 730-930 AM @ Denny's 6850 King George Blvd., Surrey OTC Open: 10-Noon CONTEST: MO, MI, LA QSO Party
3 CONTEST: MO, MI, LA QSO Party	4 On-line Basic Course 19:00 hrs	5 1930 SEPAR Net 2000 SARC Net	6	7	8	9 Coffee: 730-930 AM @ Denny's OTC Open: 10-Noon CONTEST: NE, NM, GA QSO Party
10 CONTEST: NE, NM, GA QSO Party	11 On-line Basic Course 19:00 hrs	12 1930 SEPAR Net 2000 SARC Net	13 SARC General Meeting (Zoom) 1900-2100	14	15	16 Coffee: 0730-0930 @ Denny's OTC Open—10-Noon CONTEST: CQMM DX (CW) & ON, QC QSO Party
17 CONTEST: CQMM DX (CW) & ON, QC QSO Party	18 On-line Basic Course 19:00 hrs	19 1930 SEPAR Net 2000 SARC Net	20	21 SEPAR Meeting	22	23 Coffee: 0730-0930 @ Denny's OTC Open—10-Noon
24	25 On-line Basic Course—Review 19:00 hrs	26 1930 SEPAR Net 2000 SARC Net	27 1900 SARC Exec Meeting	28	29	30 Coffee: 0730-0930 @ Denny's OTC Open—10-Noon CONTEST: FL QSO Party

Contest Details: http://hornucopia.com/contestcal/contestcal.html

Local Ham Gear For Sale

More listings at hamshack.ca

For sale is a **Kenwood matching speaker** (blue-grey), model SP-70. The Kenwood SP-70 is a great addition to your TS-400 or the TS-700A series transceivers. It features a 4.75 inch speaker element and can handle up to 2.5 Watts. This 8 ohm speaker has a frequency response of 300 to 5000 Hz. The rear panel has screw terminals. Measures 6.5 x 4.875 x 7.875 inches 3 lbs
Asking $50

Contact: John VE7TI ve7ti@rac.ca

Equip an entire station!

HF transceiver Icom 7600 6-160m
Interface/keyer + cables for above—Microham MKII
Terminal node controller—KPC 3 plus
12v power panel—MFJ-1126
12v power panel—Rigrunner 4008
High power tuner—LDG AT-1000ProII
Pwr/swr meter for tuner (sold together) LDG M-1000
1 kw HF amplifier & manual + spare 3-500Z tube—Ameritron AL-80A
Keying relay for above (sold together) - Ameritron ARB-704
Programmable CW keyer—Logikey K5
SDR—SDR Play RSP2Pro

WANTED: **Old National Geographic and Reader's Digest Magazines.**

Contact: John VA7XB va7xb@rac.ca or 604-591-1825

HF Radio Transceiver

Kenwood 450SAT (built in antenna tuner) capable of 100W. It also has the YK88S Filter installed and the Voice Synthesizer option. There is a hand mic for the radio as well. Along with the radio there is the 20 amp Kenwood PS50 power supply. The radio typically sells for around $450-500 USD used, and the power supply 100-150 USD.

I am asking $500.00 for the pair.

Contact: Gord VA7GK va7gk@shaw.ca or 604-582-3983

SURREY AMATEUR RADIO COMMUNICATIONS

Radio-Active

Profiles Of SARC Members

We welcome Andrew Elgin VA7LGN, one of SARC's newest and most enthusiastic members, who has written the exam and obtained his certification with honours before completing even half of the course. Andrew immediately took steps to join SEPAR and made his debut as net control operator a few days later. Here's what we learned about Andrew's background and interests.

Andrew was born in Vancouver and received his education in the metro-Vancouver area. He is married to Melanie, his wife of 9 years. Now residents of Surrey, they have 2 young children, 5 and 3 years old and a dog named Oscar.

Andrew has worked in the insurance business as sales agent and claims agent for 15 years. During the Calgary floods, one of the worst disasters in Canadian history, he acted as claims adjuster and later as trainer. More recently, he has taken on the job of business analyst where he is the go-between for the sales department and the IT department of his firm. With a special interest in emergency response, he has set up emergency evacuation procedures and is also the first aid attendant for the office.

Having a musical background with guitar and drums, Andrew studied music at Douglas College before deciding he didn't want to make a career of it. However, he still enjoys music and (until COVID) played in a retro rock band which was in demand at various bars throughout the Lower Mainland. His special interest is in folk and Irish music, which led to his learning to play a bouzouki (a kind of Irish guitar). He has also performed with the Delta Concert Band and the Vancouver Philharmonic Orchestra both on French horn and percussion.

From age 12 to 18 he was in air cadets where his first exposure to radio was on a major exercise using surplus AN/PRC 77 backpack radios to learn radio operations. Cadets would walk 50m apart and practice using the phonetic alphabet, doing radio checks, and experience running a radio net. FRS radios were introduced in 2000 at which time he got his first set and started using them in cadets shortly after.

While working with cadets as an adult he met several hams who aroused his interest in amateur radio. He studied on and off independently for the test but finally in 2022 decided that it was

Andrew Elgin VA7LGN

time to complete his studies and write the exam.

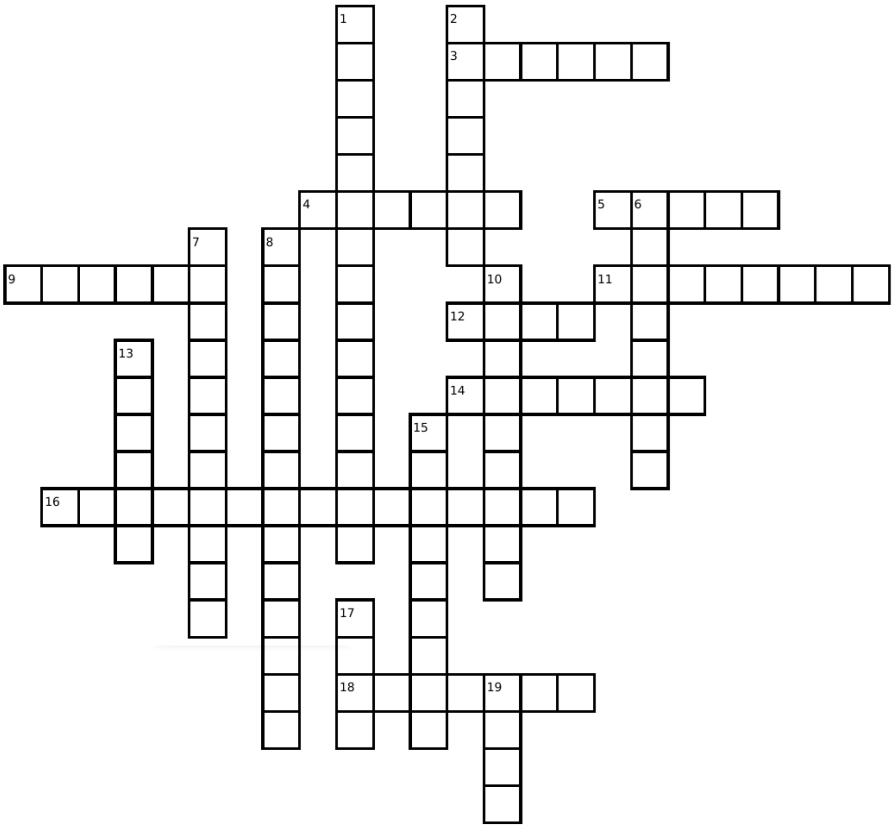
Having achieved that objective, Andrew is especially interested in APRS and integration of amateur radio with the Internet as well as emergency services through SEPAR.

Andrew reports that he has found the SARC and SEPAR community extremely welcoming both on the air and during meets on Saturdays at the OTC.

He says “there is so much to learn, so much to see and do with this hobby. I'm hoping to be able to use the HF equipment at the OTC, since putting up an HF antenna in my condo is not feasible. I'm also continuing my active involvement with SEPAR and am looking forward to helping with some projects this year.”

Welcome to SARC and SEPAR, Andrew.

~

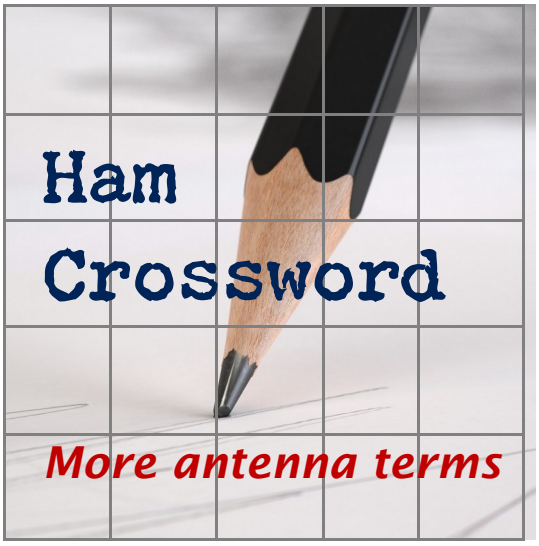


Down:

1. radiation pattern of a vertical antenna
2. Predicted electromagnetic theory
6. Antenna conductors
7. Transmission or dissemination
8. Receiving or transmitting signals in a given direction
10. elements not directly connected to the feed line
13. Array of parallel spaced dipoles
15. Range of frequencies
17. Yagi-Uda
19. No energy in the direction of the conductor

Across:

3. Another word for antenna
4. Two-element basic antenna
5. First antenna builder in 1888
9. Greek personification of the clear upper air of the sky.
11. Long wire receive antenna invented in 1921
12. Measure of the increase in signal amplitude
14. Developer of long-distance antennas
16. Describing antenna waves
18. Conductor that transmits electromagnetic waves



Solution on page 122

SURREY AMATEUR RADIO COMMUNICATIONS

The OTC Report

John Brodie VA7XB

Short term planning

It is gratifying to observe that our Operations and Training Centre (OTC), which SARC shares with SEPAR and South Fraser Search & Rescue, is getting increasing use by members and prospective members.

Following breakfast at Denny's restaurant on Saturday morning, we are experiencing large turnouts by persons who need help with various antenna, equipment and computer/software issues or simply wish to discuss technical problems. The space is also being used for examinations, training and increasingly for contesting. Here are a few of the projects under discussion for improving the radio room and antennas:

Our container is now cleaned up, organized and accessible

1. connecting up new cables for the generators and testing to ensure that they can provide power to the radios when needed.
2. We have been discussing the relocation of storage batteries from the radio room to the adjacent room where they will be more accessible for servicing.
3. The source of intermodulation which is affecting HF radios when used at the same time needs to be corrected; several steps have already been taken in attempts to cure this problem (without success) but the next step is to create a low resistance conductor from the top of the tower to the bottom, to (hopefully) short out a rectifying junction which appears to originate at a tower joint or fastener.
4. The plan to relocate the wire antenna (used for 40 and 80M) has been abandoned for now as infeasible given the absence of suitable trees.
5. Other projects involve enhancing our capability for all VHF/UHF modes and bands.

Some of these issues are simple and require only money and effort to remedy. Others require our full ingenuity to diagnose and solve. Bit by bit, we are getting there.

~ John VA7XB

As a result of recent COVID restrictions, we were unable to run the **CW course** in January as planned, so it has been postponed. You will be advised of the new start date for the course when we are able to see sufficiently far ahead to plan for it.

Apologies, but this is, of course, beyond our control.

~ John Brodie

A course update…

We have just completed another SARC/SEPAR Basic Amateur Radio on-line course this week. The students write their exam after the course review on March 1st.

This was another large turnout with students from well outside the Greater Vancouver area, including several students unable to take local courses because they live in remote areas.

The instructors do not get much respite however. Even as the January class started, we had a waiting list for our next class, which is now scheduled to start on March 21st. We also hope to schedule the classroom CW class once COVID restrictions are eased.

My thanks to fellow instructors Stan Williams VA7NF and Kevin McQuiggin VE7ZD, and of course our course administrator John Brodie VA7XB.

~ John VE7TI

The class was quietly doing its lesson when Russell, suffering from poor propagation at home, prepared to key up with 1500 Watts.

The Contest Contender
VE7SAR

John Brodie VA7XB

ARRL International DX Contest (CW)

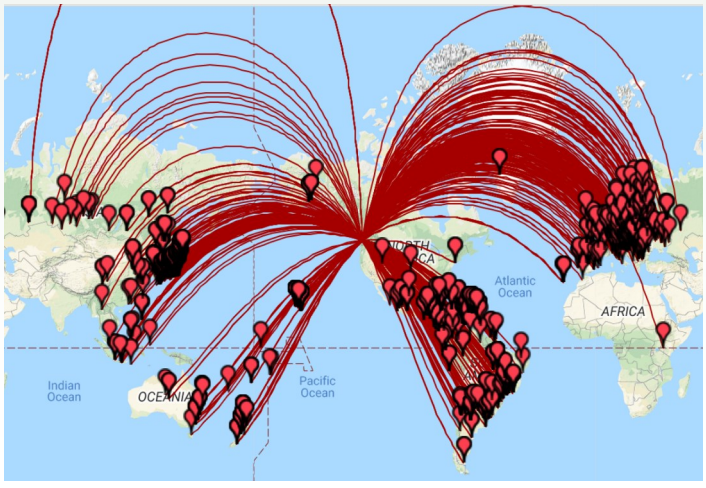
We have a few CW operators in SARC, but they are old school, seasoned operators who can show up at their allotted time and hit the road running with little need for orientation or coaching, which is helpful to the contest organizer (me). Participants in this contest were Slawa VE7LWW, Jan VA7VJ, Les VA7OM and myself, VA7XB. Two days of continuous contesting is a long time, which means that with only a few operators, shifts had to be relatively long to fill the available 48 hours. Slawa worked from 4 pm through the night to 7 am on Friday evening and Les also put in long hours Saturday afternoon and evening. Daytime activity was brisk, but night-time propagation on 40 and 80 m was poor so it was especially hard work for these two.

In this contest, only DX contacts count and competition is stiff for those DX stations available. We found that "running" i.e. calling CQ and waiting for the DX to respond is not very productive under these rules. It's mostly search-and-pounce for the DX quarry. It helps to have a good directional antenna and a kw of power to break through the pileups and we are fortunate in that regard.

Even though the propagation forecast was poor for the higher bands, we were able to make many Qs on 15 and 10m which is the blessing of higher solar activity as we move into the more active sunspots phase of the 11-year cycle. Our wire antenna for 40 and 80m bands is compromised, but we found it adequate to make contacts into Europe, N. Africa, and the East Indies (Malaya and Indonesia). The final tally was 1060 contacts for a claimed score of 680,000 pts.

By midday Sunday, 95% of the available DX stations on the air had been worked, so after that it was slim pickings. Once again, our equipment performed flawlessly with no computer crashes or failures of any kind. What's next on the contest agenda? Aside from various state QSO parties, we have the BARTG RTTY contest on March 19-20 and the CQ WW WPX SSB contest on March 26-27. See you then.

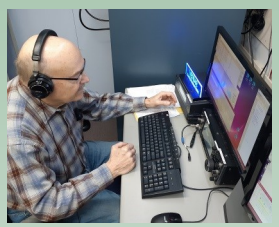
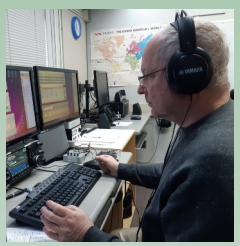
~ *John VA7XB*



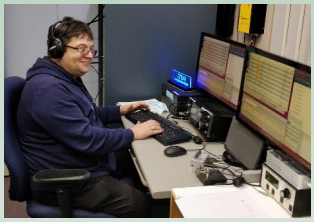
A screen grab of our contest contacts generated by the Adventure Radio link, as described in the article on *page 10*.

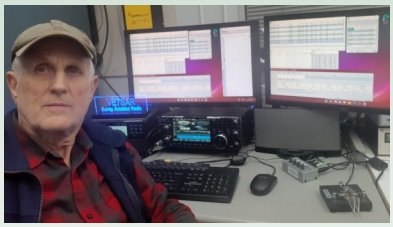
The BC QSO Party









The remarkable thing about this contest was that was essentially uneventful (thankfully) as the equipment and software performed without any problems whatsoever. Best part was that we had full participation by 8 members of the contest group.

The operating schedule was completely full, to the extent that the longest shift for any individual operator was 3 hours, but most had to be satisfied with 2. The operators list, in order of appearance, comprised Sheldon VA7XH, Jan VA7VJ, Les VA7OM, John VE7TI, Thomas VE7TXL , John VA7XB, Kevin VE7ZD, Steve VE7SXM and Slawa VE7LWW using CW and SSB alternately throughout the 2 day event.

It is satisfying that all regular participants are now sufficiently proficient that they can operate unsupervised, once the equipment and N1MM logger have been set up and tested. We operated M1HP, which means multi operators using one radio at 1 kw.

The statistics demonstrate that everyone pulled their weight and contributed to a total of 953 Qs for a score of 769,000.

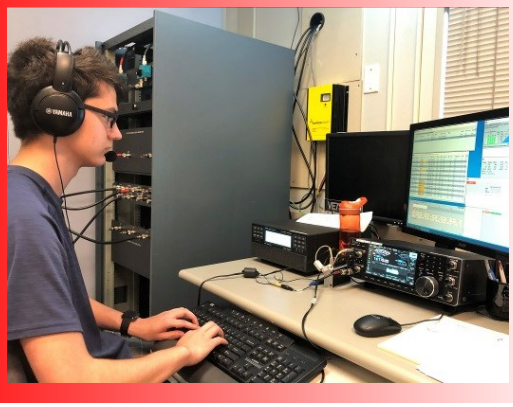
Operator/Band	3.5	7	14	21	28	Total
VA7OM	0	0	96	7	11	114
VA7VJ	0	0	91	81	0	172
VA7XB	0	1	77	0	0	78
VA7XH	0	1	67	8	0	76
VE7LWW	0	28	23	41	4	96
VE7SXM	0	0	90	0	1	91
VE7TI	6	0	196	0	0	202
VE7TXL	0	44	0	0	0	44
VE7ZD	0	0	0	49	24	73
						946

~ *John VA7XB*

SURREY AMATEUR RADIO COMMUNICATIONS

John Brodie VA7XB

The 2021 Canada Day Contest ...an update



It is often said that a benefit of competing in radio contests is the opportunity it provides to identify problems with your setup and an incentive to fix them before the next contest (or emergency). That was certainly the case this time as it became obvious that we have more work to do before we can claim that our equipment is fully functional at our Operations & Training Centre (OTC).

Two days before the RAC Canada Day contest, we accepted an offer to make a team effort using the official RAC callsign, VE7RAC. Because callsigns ending in RAC generate bonus points for those who complete a contact, it was expected that we would have a respectable presence on the bands.

Although equipment and antennas operated flawlessly at Field Day, the challenge of the RAC contest represented a quantum leap greater, for a few reasons. Firstly, whereas we operated only 1 station at Field Day, we elected to operate 2 radios this time. Secondly, we made the decision to operate both stations at high power.

Thirdly, we were using our triplexer/diplexer equipment for the first time at high power (as COVID came along last year just as

Left from the top: VA7XB checks SWR as Steve VE7SXM and Thomas VE7TXL look on. Steve demonstrates contesting and the features of N1MM+ before Thomas jumps in to operate in run mode. Thomas did amazingly well and shows promise as a capable contester.

SURREY AMATEUR RADIO COMMUNICATIONS

these units were completed). Lastly, we would be simultaneously using two separate antennas that are, by necessity, in close proximity to each other.

This combination of factors made for a different experience compared with Field Day, as we soon found that they were to give us some problems.

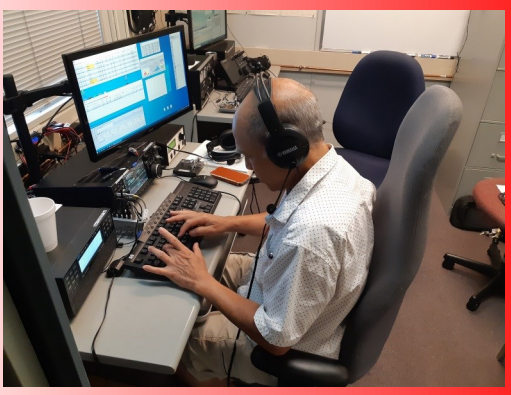
These problems began even before the contest started: we learned that the bandpass filter/triplexer unit did not tune properly on 15m. Disassembly of the bandpass filter revealed a broken solder joint, no doubt a result of jostling during the move-out from the old, or move-in to, the new OTC.

Shortly after the start of the contest when Steve VE7SXM was on 20m SSB using the IC-7610 and Stan VA7NF was on 40m CW using the Flex 6600 plus linear amplifiers in both cases, other issues became evident.

On several occasions, N1MM froze up and the computers had to be restarted. Then it became impossible to operate voice because of the loud intermodulation heard on the SSB radio originating from the other radio's CW.

Some quick adjustments were made to improve equipment bonding/grounding, but the only real solution was to reduce power on both radios, which helped with the intermod and PC crashes. Even so, the difficulties did not end until only one radio was operating by itself. From then on, it was smooth sailing but the disruptions cost us time and aggravation.

Nevertheless, the experience was enjoyable and we know what needs doing – improved grounding is our next priority for attention at the OTC. Surprisingly, a number of foreign



Right from the top: A contest strategy conference with Stan VA7NF John VA7XB and John VE7TI and stepping through some troubleshooting. Anton VE7SSD working phone and Jan VA7VJ working CW.

SURREY AMATEUR RADIO COMMUNICATIONS

stations were active in the contest, and we were able to work them. The total number of stations confirmed was 709. A new member Thomas Willms VE7TXL was able to join the team of VA7TI, VE7SXM, VA7VJ, VE7SSD, VA7NF and VA7XB to make a few Qs as an introduction to contesting.

~ John VA7XB

By way of an update, on February 14, 2022 we were advised by RAC that we had obtained the highest score in BC for the Multi-Op—Multi-Transmitter station and had been awarded the certificate shown below.

Thanks to all the participants… a great win!

~ John VE7TI

General Meeting Minutes

January, 2022
SARC General Meeting

Attendees: 40

Start Time: 7:00pm

Location: Online Zoom Meeting

Welcome and Call to Order - (Steve VE7SXM)

Review and Approval of Agenda - (Steve VE7SXM)

- Gord Kirk motion to accept the agenda was seconded by John Brodie. Carried.

Announcements

- Richmond ARC Swap meet, Nov 27th (Steve/All) - We took in about $100.
- Feb 9, 2022 Meeting - Thomas Abbott VE7TOA/ZS1TE will speak on the MeerKAT space telescope project in South Africa.
- We are still looking for a bookkeeper to audit our financials once a year – please advise if interested and qualified.
- Saturday Breakfast and OTC (subject to Covid rules)
  - Saturday mornings 7:30am – 9:30am (or so) – Denny's at 68th and King George Boulevard
  - OTC – Open from 10am to 12pm Saturday – 5756-142nd Street

Financial Report - (Scott VA7HA)

- Club name badges are $10 and Scott will be making one more order this year. Contact Scott if interested.
- RAC insurance paid
- Ladders purchased

Committee/Other Reports (All)

- **SEPAR** - (Gord - VA7GK)
  - SEPAR Society is going through some structural changes to merge the society's assets to SARC. Regular meetings will restart this month (4th Thursday) to focus on the restructuring and projects like NEPP, Winlink, APRS, J-Pole antennas, Communications trailer, training for incident command system, emergency management, RAC, monthly test at Firehall 1. Send Gord va7gk@shaw.ca a request to attend.
  - Volunteers require a background check to participate in official activations. However, this is not required if you want to participate in training and preparation.
- **OTC** - (Gord - VA7GK)
  - Want to get an OTC Committee started to advise on the management and setup of the facilities.

- Drains were cleared to remove 4-6" of water on the roof .
- Antennas need regular maintenance.
- Power connections are required for the use of generators.
- Shared space needs to be coordinated with SFSAR.

- **Membership** - (John - VA7XB)
  - Membership is 112 paid members plus several hundred ham class graduates in their free year.
- **Contests** - (John - VA7XB)
  - At the RAC Winter contest Dec 18/19, 6 operators made 833 SSB/CW contacts. It was a North American contest but we still made a few European contacts during greyline.
  - Next contest is BC QSO Party on Feb 5/6 which is all mode but we usually only run Phone/CW.
- **Nets** - (John - VA7XB)
  - We have net control operators and backups for every week of the month, however, we would like to have more members involved. For this job, a good radio with ability to reach the repeater is required. Email John Brodie at va7xb@rac.ca to sign up.
- **Communicator** - (John - VE7TI)
  - The Dec 31/2021 Communicator went out but we didn't get on the QRZ.com home page like last month. We've had some great feedback on the issue particularly with CW being in the spotlight.
- **Ham Class** - (John - VE7TI)
  - Over 60 people are in the current class which started last Monday and will continue for the next 7 Mondays until writing the exam
  - CW class was postponed due to Covid restrictions.
- **Repeater Update/Status** - (Steve - VE7SXM)
  - We are planning to move some assets around and get the Fusion repeater on UHF set up in the North tower. This has been postponed due to Covid restrictions.

New Business - (Steve VE7SXM/ALL)

- **New Projects** List (Steve)
  - The Board is working on a list of new projects and the required funding for discussion with the membership.
  - The purpose of this process is to gain greater input from the membership, and to provide transparency in spending.
- **Flex 6600** with Maestro Operation Training – Stan has offered to run "drop-in" training sessions on the Flex 6600 – Saturday mornings 10am – 12pm to get more members using this radio (HF privileges are required for operating HF solo but anyone with Basic licence w/o honours is welcome to still sit down with Stan to learn the basics) .
- **Discussion to increase Director Spending Limits**
- **Section 10 (Reimbursement)** of the SARC Bylaws relates to purchases and spending limit rules
  - "The Director spending limit shall be an amount approved by a majority of the members at a regular scheduled general meeting"
  - The current limit is $300/month. Discretionary spending in excess of $300 in a given month would be brought to the membership for approval. (e.g. ladders and computers recently purchased). The request

is to temporarily increase this limit to $750/mo.

- Geoff Higginson moved to increase the Director spending limit to $750/month.. Seconded by John Brodie. Motion carried.

- **5 years of QST magazines** available if anyone would like them. Contact va7xb@shaw.ca

Next General Meeting (Feb 9, 2022)

- Thomas Abbott VE7TOA/ZS1TE - will speak on the MeerKAT space telescope project in South Africa.

Adjourn – Steve

- Gord Kirk moved to adjourn the meeting. Seconded by Stan Williams. Carried. The meeting was adjourned at 8:02 pm followed by 2 presentations.

Minutes prepared by Jeremy Morse VE7TMY

Presentation - Parks on the Air (Dave Jewers - VA7DBJ)

Presentation - APRS in Surrey (Reg Natarajan - VA7ZEB)

~ Minutes prepared by Jeremy Morse VE7TMY

Back by Popular Demand…

"Ask an Elmer" Night on March 9th

Our "Ask an Elmer" session last year was so popular that we are bringing it back again for the March 9th SARC general meeting. We had so many good questions that a follow-up session was necessary.

As most of you know by now, an Elmer is a long-time ham who has expertise in one or more areas of amateur radio and is willing to share that knowledge with new hams to help them get started and progress in their new hobby. SARC is fortunate to have several Elmers who are ready and willing to share their know-how.

How does this work? So, if you have a question about amateur radio, technical or otherwise, that needs more explanation or about which you are curious, then submit your question by return email to me and we will assign an Elmer to address it on March 9th.

Try and keep your questions brief and one question per email please.

You can also ask your questions during the meeting if time permits but priority will be given to those submitted in advance as it gives the Elmer a chance to properly prepare.

For the April 13th meeting we welcome back Amel VA7KBA and Les VA7OM who will have a presentation on foxhunting, in preparation for our annual foxhunt in May.

Please join us on Zoom unless COVID protocols change to permit in-person meetings to resume.

~ John VA7XB
VA7XB@rac.ca

General Meeting Minutes

February, 2022
SARC General Meeting

Attendees: 35

Start Time: 7:02pm

Location: Online Zoom Meeting

Welcome and Call to Order - (John Brodie VA7XB)

- John Brodie VA7XB (standing in for President Steve McLean who could not attend), noted that in contrast to the usual meetings, the presentation would come first followed by the business meeting.

Presentation:

- Thomas Abbott VE7TOA/ZS1TE spoke on the MeerKAT space telescope project in South Africa. The presentation was well received with many questions, concluding at 8:30 p.m.

Review and Approval of Agenda

- Kevin McQuiggin moved to accept the agenda; seconded by Gord Kirk; carried.

- Introductions included Andrew Elgin VA7LGN, a current ham class student, who wrote and passed the basic exam recently; it was noted that Andrew had volunteered to assist with net control for SEPAR and did so at the last net. Another ham class student, Manvir Judge, also introduced himself and has been a frequent visitor to the OTC on Saturdays.

Announcements

- The Mar 9, 2022 General Meeting will be an "Ask an Elmer" night - members or ham class students with questions about amateur radio can submit them to the panel.

- Saturday Breakfast and OTC (subject to Covid rules) on Saturday mornings 7:30am - 9:30am (approx.) at Denny's at 68th and King George Blvd.

- OTC - 5756 142nd Street (subject to Covid rules) is open from 10am to 12pm Saturdays for the benefit of members.

A Financial Report was presented by Scott.

Committee/Other Reports (All)

- **SEPAR** (Gord - VA7GK)
  - A few new members have applied from the ham class. The January meeting was a working session to plan out the goals for the year.

- **OTC** (Gord - VA7GK)
  - No repairs or significant changes to report since last month. Reg N. has helped us restock the supplies to the restroom as it is a shared building with SFSAR. A few contests have been held at the OTC in the last month.

SURREY AMATEUR RADIO COMMUNICATIONS

- John B. – **Saturday morning projects** to be done in the near future include setting up cabling etc. for the generators and relocation of the wire antenna.

- **Membership** (John VA7XB)
  - No change from last month with 111 paid members and several hundred ham class students as prospective members.

- **Contests** (John VA7XB)
  - This past weekend was the BC QSO Party with 9 members each operating 2-3 hour shifts making 952 contacts during the 2 days.
  - The CQ Worldwide WPX (RTTY) contest is this coming weekend. It will not be an SARC organized contest but individuals may wish to participate (contact John).
  - The ARRL International DX Contest (CW) is on Feb. 19/20. John will be reaching out to the CW operators to make up a team.
  - Several state QSO parties are also coming up over the next months.
  - ohn reminded SSB operators of the ARRL SSB Int DX contest on March 5-6.

- **Nets** (John VA7XB)
  - Anyone willing to help as a net controller should let John know: va7xb@rac.ca.

- **Communicator** (John VE7TI)
  - John plans to have the next edition ready for March 1st. If anyone has articles or story ideas please forward them to communicator@ve7sar.net

- **Ham Class** (John VE7TI)
  - Week 5 of the current ham class was just completed. Next week we will be covering regulations and procedures. The next class will start March 21st with a large number signed up already.

- **Repeater Update/Status** (Steve VE7SXM)
  - With Steve absent, Gord provided an update. Two weeks ago the old standby Master II repeater was removed from the north site and relocated to the south site. All 3 repeaters are still active at the north site. The Yaesu fusion repeater is still active at the south site but will be removed for programming by Horace. Digital voice will be unavailable while that work is being performed.

Old Business

- The Executive is in the process of reviewing potential bookkeepers for a year end audit - thanks to those who volunteered.
- Generator Testing - power cords have been purchased for the OTC generator for testing on an upcoming Saturday.
- Training on the Flex 6600 with Maestro has been offered to members by Stan on Saturday mornings 10am - 12pm.

- **SARC 2022 Project list**
  - The board is working on a list of new projects for discussion with the membership.

New and other business

- None

SURREY AMATEUR RADIO COMMUNICATIONS

Next General Meeting March 9, 2022

- As noted above this will be an "Ask an Elmer" session

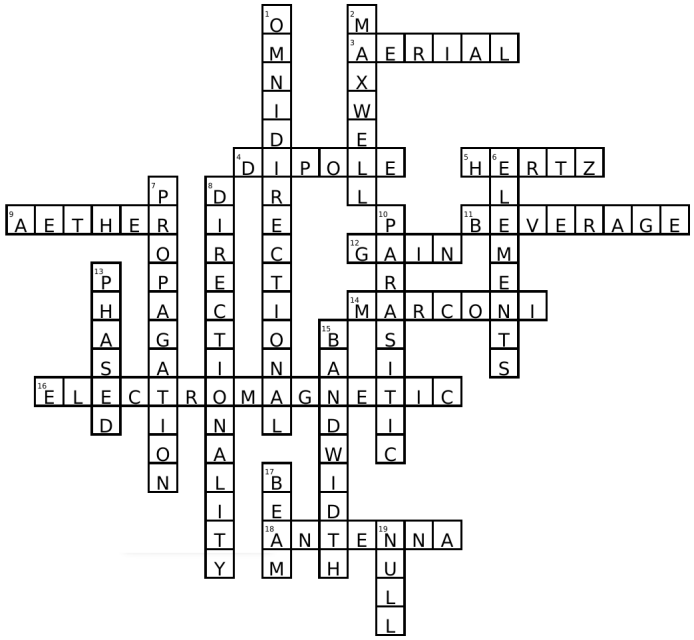
Adjournment of the Business Meeting

- Gord Kirk VA7GK moved for adjournment. William Teskey VE7PFP seconded. Carried

Meeting adjourned at 8:57pm

~ Minutes prepared by Jeremy Morse VE7TMY

Crossword solution from page 109



We welcome your comments and feedback

Please consider leaving a comment via email to communicator@ve7sar.net, or on our blog site https://ve7sar.blogspot.ca or, better yet, contact our authors directly, so they know someone is out there reading our publication.

A reader response to our CW coverage

I'm just reaching out to let the Surrey Amateur Radio Communications know your 'So You Want To Learn CW (Morse Code)' post was a big help to my daughter Corrine and a 'Famous Inventors and Inventions' project she's working on for her technology class. Her teacher thought it would be fun for the class to learn about a new invention or technology each week that changed history. The students are then required write a short paper about what they learned, and how it impacted society. It's been fun for both of us!

Right before Christmas break, Corrine's teacher assigned a lesson on the telegraph and Morse Code! Your page led us to some great websites to check out, so Corrine and I wanted to make sure we thanked you!!

I was also hoping you could add a contribution from Corrine to your page? She found a timeline of the telegraph that I loved. It was neat to see how Morse Code and continuous wave changed the history of communication.

I'd love to show Corrine and her teacher! It's always nice getting some recognition for a job well done, and perhaps Corrine will even get some extra credit? Brownie points would be nice with the next round of report cards coming out soon!

73 (I just learned this!)

Mrs. Sarah Jackson

Hamshack.ca

- Receives 12,000 or so visits per week
- Has over 500 registered users
- Usually sits at about 250 active listings as items seem to move very quickly

Most importantly, I have continued with the amateur radio club listing initiative and recently added a self-enrolment form for clubs to add their own listings on the site. In addition, living through a pandemic made me realize the important of emergency planning, and the importance that amateur radio plays in the emergency management field, by providing emergency communications services to public agencies and other organizations. Group representatives adding their organization to the site now have the ability to list the emergency communications services provided by their group.

It is anticipated that this emergency communications inventory will be accessed by public and other organizations to augment existing communications capacity for inclusion in emergency management planning.

~ Don Rosberg, VE7DXE
250.380.8401

SURREY EMERGENCY PROGRAM AMATEUR RADIO

SEPAR Report

Gord Kirk VA7GK
SEPAR Coordinator

The OTC is available for your use

As we come to what appears to be the end of the Pandemic, and two years of impacting in person meetings we can now look forward to planning SEPAR meetings. As part of the city's Emergency Program we were able to meet following a COVID plan however we did meet together using virtual tools, Zoom.

As a result of changes during this time we have now become familiar with tools such as Zoom and have had good attendance and were able to maintain our program during this time. Presentations and lessons learned from other areas of the world are now available locally for our meetings. As an example we recently arranged, in conjunction with SARC, for a presentation on the AREDN mesh network. The presenter did this virtually from Vancouver Island. We have a couple of SEPAR members exploring how we might these MESH technologies this within our emergency program in the city.

As well we have had two presentations on APRS. The first was on some of the technical details and use when Mobile.

The second presentation was on the various ways APRS can be used and the capabilities it will help provide in an emergency. Besides placing your position on a map, APRS can be used to send short messages radio to radio, text to cell phone (non-amateurs cannot reply) and also to send Winlink email messages. All of these capabilities do provide a tremendous benefit to emergency operations/deployments.

From this presentation, a plan was created to test setting up inexpensive APRS sites to cover all of Surrey. While still in the development stage, the plan will be to set up low power sites to provide coverage throughout the city. We hope to identify areas which may have poor coverage and determine if we can set up a site to provide the ability to use APRS in these areas.

SEPAR has also continued to encourage the regular testing of WINLINK. We start with getting the members computers set up with WINLINK and using it with Telnet (local internet). We then can help individuals with TNC and radio set up to use VHF packet to communicate. We host

SURREY EMERGENCY PROGRAM AMATEUR RADIO

a weekly digital check-in with an email sent out to participants and asking for a reply using the WINLINK system. It is as easy as this.

One other area we are seeing very encouraging progress is with the OTC (Operations and Training Center). The Radio room is set up with contest grade HF stations and good VHF/UHF coverage. The station is being used for contests as well as training. Each Saturday we have held a drop in for assistance on anything radio related. We have helped with testing antenna's, tuning mobile antenna's on cars, answering questions on mobile installations, programming radios, and helping set up WINLINK on computers and radios.

It has been so encouraging to see recent licensing class graduates show up with questions or wanting help. We have had them also join SEPAR. It is great to hear the on-the-air the changes in signals from some individuals during our nets. Like most newly licensed hams, many buy the first radio as a portable. Then they come and build a roll up J-Pole antenna and test it out. The next week, the signal during the net is substantially improved.

Ultimately this is the hope for the Emergency Program within the City. While we do have radios rooms at the OTC and the City EOC (Fire Hall 1), we have grab and go kits (3) available to use, we have a communications trailer as well. Lastly we have small VHF radio kits located at the various Community Police Stations throughout the city. The first communications in a major incident will likely be by an amateur on their own equipment. This is the hope that each licensed amateur in the city will have their own tested equipment which they know works, and can program etc. It will not be until we start responding formally that the kits and trailer will be used.

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary:	Coquitlam/Abbotsford	146.430
Primary:	Inter-Municipal Group 3	146.445
Primary:	Vancouver; Mission; Sec. Coquitlam	146.460
Primary:	Kent-Mission; Sec. Richmond	146.475
Primary:	Inter-Municipal Group 2	146.490
Primary:	New West; Sec. Richmond	146.505
National	Calling / FM Simplex Group I	146.520
Primary:	North Shore; Port Coquitlam	146.535
Primary:	Bowen Island; Surrey	146.550
Intermunicipal Group 1 Coordination		146.565
Primary:	Lions Bay/Vancouver/Delta/Langley	146.580
Primary:	Port Moody; Sec: Burnaby	146.595
Secondary:	Vancouver/Surrey	147.420
Secondary:	Vancouver (UBC) / Maple Ridge	147.450
Primary:	White Rock/Chilliwack; Sec. No. Shore	147.480
Secondary:	Burnaby/Pitt Meadows	147.510
Primary:	Delta; Sec: Abbottsford	147.540
Primary:	Hope; Sec: Delta; ALSO EMBC	147.570

Surrey Emergency Program Amateur Radio

SURREY EMERGENCY PROGRAM AMATEUR RADIO

Our weekly nets are every Tuesday night on the SARC repeater on 147.360 + T110.9 at 07:30 pm PST. All are welcome to check in.

So we will continue to support and encourage amateurs to get on the air and use their radios, learning how to improve their signals, operate from park as part of Parks on the Air etc. All of these activities will ultimately create radio operators we can count on during an emergency.

On a final note this month the SEPAR website has been worked on. We have moved it. The address is still the same www.separ.ca. You may have to delete you old link and reenter it to see the changes.

As always please reach out if you have any questions or comments or if you would like to participate in the SEPAR program within Surrey.

If you are interested in the SEPAR program, and wish to become more involved, please let us know. Our website is www.separ.ca and there is a contact form to get in touch with us.

~ Gord Kirk VA7GK
SEPAR Coordinator

SEA-PAC® 2022 Convention

"The Northwest's Largest Ham Convention"

June 3-5 2022 - On the beautiful Pacific Ocean beach—Seaside Convention Center

The 2022 SEA-PAC QSO Party is being planned for the weekend before SEA-PAC
Saturday, May 28, 2022

Looking Ahead...

Steve McLean VE7SXM

Well, Spring is almost here, the weather in the Surrey area is starting to improve, outdoor projects and activities are beginning to restart. In addition it appears that many of the COVID restrictions are being lifted where gathering size limits have been removed. We are looking forward to getting together more this year than we had been able to over the past two years. We are now seeing our Saturday morning breakfast attendance increase as well as the open house at our OTC that follows the breakfast. We are anticipating that we will be able to participate in field day this year as well as a couple of Fox Hunt events.

However, we have not been standing still over the fall and winter, we have continued to host a few contests from our OTC station, using our ICOM 7610 and our new computers, although the radio room is small, we have two excellent stations set up and operational for all modes of (HF) operation.

As I mentioned in the last QRT, we have several projects planned for this year that will provide enhanced capabilities within the OTC, with remote access, addition of an all mode VHF/UHF station, and additional VHF/UHF antennas for the OTC. We have begun testing of APRS within the Surrey area and hope to implement APRS within our OTC and repeater sites. Also, we had implemented a Yaesu repeater at one of our sites, and should have that repeater connected to Wires-X very soon. We have also begun enhancing our emergency power capability for the OTC with a repurposed 230V generator that would be connected to provide power to operate the OTC as needed.

In addition, our hats go off to our awesome training team, who have perfected remote training over the web, and continue to produce high quality Ham radio operators, not just in Surrey but across many parts of Canada.

Looking for nicer weather and getting together more in 2022.

~ Steve VE7SXM
SARC Society President

SARC SOCIETY DIRECTORS 2020-2021

PRESIDENT
Steve Mclean VE7SXM
president at ve7sar.net

VICE PRESIDENT
John Brodie VA7XB
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Gord Kirk VE7GK
(SEPAR Liaison)

Kevin McQuiggin VE7ZD / KN7Q

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF

SARC MEMBERSHIP, NET & CONTEST MANAGER
John Brodie VA7XB
membership at ve7sar.net

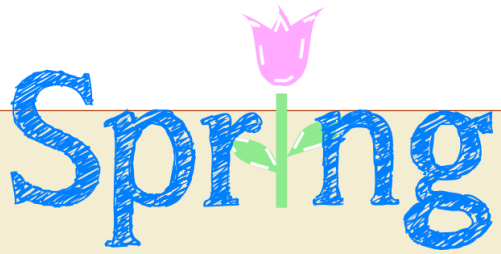
SARC QSL MANAGER
(pro tem) John Brodie VA7XB

SARC REPEATER MANAGER
VACANT
repeater at ve7sar.net

A look back…

From The Communicator—March 2012

Well, the plan was there but not the paying customers. There was a suggestion that we charter a bus to attend the annual Seaside HamFest in Oregon. There was lots of support at the General Meeting that month but few actually paid so the plan was scrapped. Click on the graphic to see that issue.



March—April

Spring ahead!

Our "Ask an Elmer" session last year was so popular that we are bringing it back again for the Wednesday, March 9th SARC general meeting. We had so many good questions that a follow-up session was necessary.

For the April 13th meeting we welcome back Amel VA7KBA and Les VA7OM who will have a presentation on foxhunting, in preparation for our annual foxhunt in May

Please join us on Zoom unless COVID protocols change to permit in-person meetings to resume.

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We are looking for a SARC Net Manager. Its not a difficult job and, if you have some time to spare, we'd like to hear from you. Basically it involves scheduling someone to do the Tuesday evening weekly net.

	SARC Net 20:00 Hrs
1st Tuesday Standby	Jean-Luc VA7JLU Reg VA7ZEB
2nd Tuesday Standby	Jinty VA7JMR Sheldon VA7XNL
3rd Tuesday Standby	Rob VE7CZV REG VA7ZEB
4th Tuesday Standby	Kapila VE7KGK John VA7XB
5th Tuesday Standby	Reg VA7ZEB John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

COVID permitting, Saturday between 0730 and 0930 hrs at the Denny's Restaurant, 6850 King George Blvd., Surrey BC

Workshops

Saturday between 1000 and Noon at the OTC 5756 142 Street, Surrey BC

SEPAR Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+
Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+
Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6
Tone=110.9Hz

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for SARC.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.

We thank our sponsors for their support of SARC

Please support them.